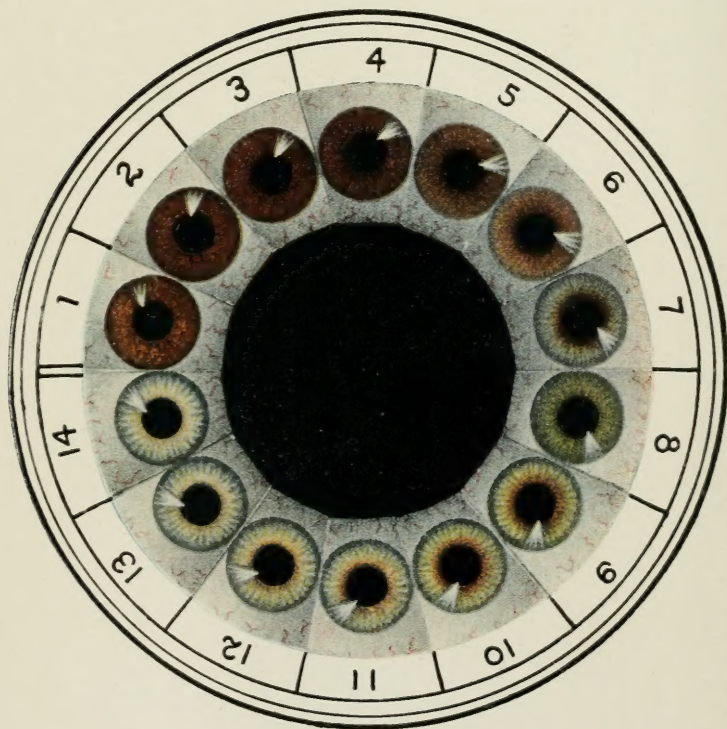
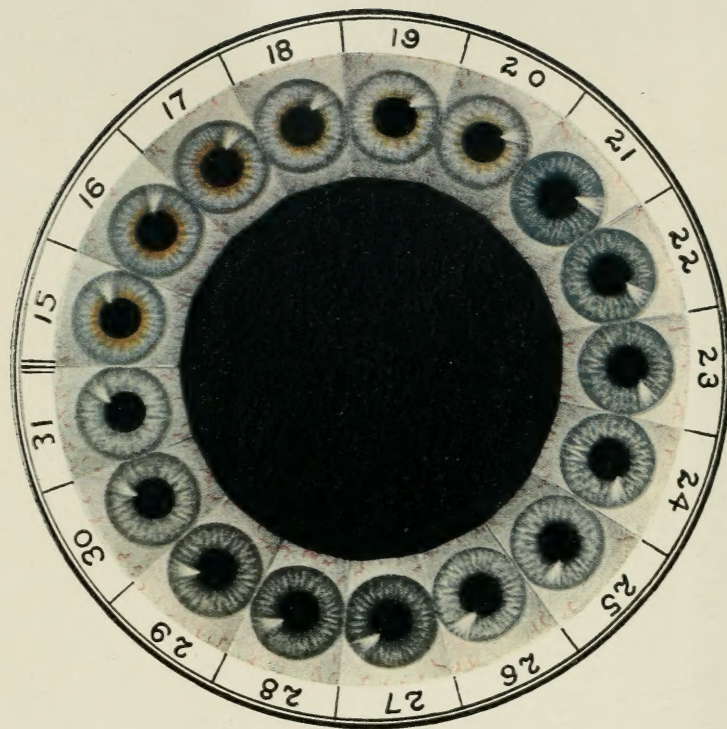


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Dr. Wetherill's Eye Color Chart.

INTERNATIONAL CLINICS

A QUARTERLY

OF

ILLUSTRATED CLINICAL LECTURES AND
ESPECIALLY PREPARED ORIGINAL ARTICLES

ON

TREATMENT, MEDICINE, SURGERY, NEUROLOGY, PÆDIAT-
RICS, OBSTETRICS, GYNÆCOLOGY, ORTHOPÆDICS,
PATHOLOGY, DERMATOLOGY, OPHTHALMOLOGY,
OTOLOGY, RHINOLOGY, LARYNGOLOGY,
HYGIENE, AND OTHER TOPICS OF INTEREST
TO STUDENTS AND PRACTITIONERS

BY LEADING MEMBERS OF THE MEDICAL PROFESSION
THROUGHOUT THE WORLD

EDITED BY

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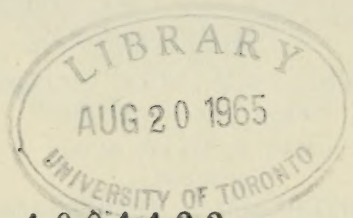
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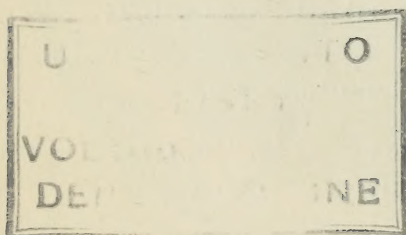
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Diagnosis and Treatment

REFLECTIONS ON ANGINA PECTORIS

WITH SPECIAL REGARD TO PROGNOSIS AND TREATMENT

By W. S. THAYER, M.D.

Hon. F.R.C.P.I.; Visiting Physician, Johns Hopkins Hospital; Professor of
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WHAT do we mean when we say "Angina Pectoris"? We are speaking of a group of symptoms largely subjective—a syndrome, the characteristics of which are a sensation felt usually in the præcordium or epigastrium varying from an indefinite sense of fulness or constriction to a pain of a peculiarly distressing character. This is variously described as gripping, vice-like, crushing—or a sense of fulness and pressure which, sometimes, is relieved by eructation, so as to lead the uninitiated and a strangely large proportion of those who should know better, to ascribe the symptoms to "indigestion." "Acute indigestion" is a term which, in the newspapers, at least, has become almost a synonym for angina. This is often accompanied by a dead, sickening, "toothache"-like sensation radiating into neck and shoulder or ulnar side of the left, more rarely the right, sometimes both arms in the course of the distribution of the eighth cervical and first and second dorsal nerves. The pain in the arm may be intense but the sensation is often merely a numbness or paræsthesia. Sometimes, as is well known, the pain or numbness is felt at first only in arms or neck or epigastrium from which regions it may radiate to the præcordium. These symptoms are commonly associated with a distressing anxiety—a sense of impending calamity—of imminent death.

Perceiving these sensations at first, often after meals, usually when he is engaged in some pursuit involving physical effort—walking up an incline or against a wind or hurrying for a car, or under

emotional excitement—anger, worry, fear—the patient intuitively stands still. With graver pains he *must* stand still, sometimes rigidly fixed in one position, the face ashen and anxious, the forehead studded with beads of sweat. With rest and, perhaps, several eructations of gas, the sensation passes, only to return sooner or later, under similar conditions.

This is the characteristic angina—the “angina of effort” as it is called by Vaquez.

As time goes on this syndrome brought on, at first, only by evident effort, comes with ever slighter and less apparent cause—in association with little family vexations, at night, awakening the patient from sleep, in the bath, at stool, at rest, until in the end—unless in the meantime, he drop dead without a warning—the sufferer, bed-ridden, may lie for hours or days in an almost continuous *status anginosus*. More commonly the weakened heart gives way under the strain and the patient dies dropsical with the usual signs of a failing heart.

Sometimes the very first attack may come while the patient is at rest; in these instances it is generally severe and of grave immediate import.

The three striking characteristics of the syndrome of angina are: (1) Its distribution, præcordium, epigastrium, neck, ulnar side of arms, especially the left.¹ (2) Its aggravation by effort or emotion. (3) Its association with a peculiar sense of anxiety, of *angor animi*.

The aggravation of the symptoms by effort, their cessation with rest, the imperative necessity of rest in many instances, is the most striking feature of the syndrome. One of my patients, a man of 68, discovered that when walking up an incline or when hurrying, he was seized with pain in the right canine teeth. He felt obliged to stand still. So soon as he stood still, the pain subsided. There was hypertension—maximal pressure, 170-180—and a moderate cardiac hypertrophy with a slight systolic murmur in the aortic area. The relation of these pains to effort was so characteristic that I had no hesitation

¹ The area of distribution of the pains as well as its association—not infrequent—with cutaneous supersensitiveness in the affected areas, is shared by those pains sometimes met with in other forms of cardiac disease notably in mitral affections.

in making a diagnosis of angina pectoris. Later he had more typical attacks and died suddenly.

Angina pectoris is a syndrome clear and unmistakable in outspoken examples, but by no means easy to recognize with certainty in the very frequent larvate cases. A common phenomenon in private practice, it is relatively rare in the wards and even in the out-patient departments of our large general hospitals.

It is a syndrome occurring especially among the more educated classes of the community.

Why is this? Are the underlying pathological changes commoner among the more educated classes? I think not. A study of the pathological material in any of our large hospitals speaks against such an idea. It is probably because angina is a syndrome depending largely on subjective sensations. The individual in an anginal attack is a striking and characteristic picture, but we do not very often see our patients in their attacks and our diagnosis in nine cases out of ten depends on the story that they tell.

A considerable proportion of the patients that fill the general wards of our hospitals are in this respect practically mute. They are incapable of describing the nature of their pain or its radiation; they do not reflect upon its relation to effort; it is often only by chance that we gain from the history elicited a mental picture that reveals the nature of the process. To these difficulties it may be added that resulting from the circumstance that many of the occupants of beds in our general hospitals have little or no acquaintance with the English language.

More than this, it is not only that a considerable proportion of the uneducated are unable to communicate the character of the symptoms from which they suffer; it is that some of the symptoms which occupy the foreground in the picture of the sufferings of the educated, highly sensitive man are with them much less acute.

It is interesting to compare the description of an anginoid attack by a sensitive man or woman of the more highly educated classes with that which one is able to extract from a colored patient, for instance, in the ward of a hospital. From the former one obtains a vivid picture of a more or less characteristic anginoid paroxysm. From the latter, by patient questioning, one learns that patient has had pain about his chest or in his arm or in his "stomach"; that the

pain was so severe that he stopped work; that the pain stopped when he gave up work—that it returned with effort. The *angor animi*, the sense of impending dissolution, is commonly quite absent. It is unusual for a colored patient to describe the sense of anxiety so characteristic of the anginoid syndrome.

In some regions—notably in France—angina appears to be commoner in the general hospitals than with us. But the average inmate of a Parisian hospital is more sensitive, more highly educated, more introspective, and immeasurably more capable of describing, and more prone to describe his sensations than are the like inmates of hospitals in our larger cities.

Vaquez divides angina into two classes, the “angina of rest” and the “angina of effort.” The two pictures he presents vividly; they are clear and familiar.

The “angina of effort” corresponds to the clinical picture that has been described. The “angina of rest” as described by Vaquez corresponds, in most respects, to that group of symptoms characteristic of syphilitic aortitis and dilated aorta with aortic insufficiency or hypertension and dilated heart—a condition particularly associated with nocturnal attacks of so-called cardiac asthma. Characteristic anginoid paroxysms may occur in luetic aortitis; sudden death is common. The attacks of nocturnal suffocation are frequently accompanied by considerable anxiety, but in our experience pain is not a prominent feature in this syndrome, and in this country the nocturnal anxiety and dyspnoea of luetic aortitis are not, as a rule, classed as angina. I am inclined to believe that the symptoms of pain and anxiety so common among Vaquez’ patients, highly sensitive and notably gifted with the ability to describe their sensations, are less prominent in the more phlegmatic and intellectually dormant individuals who populate our wards, patients with whom diagnosis is far more an objective matter. One may or may not approve of Vaquez’ division of angina into the “angina of rest” and the “angina of effort”; but I do not see how one can fail to recognize the correctness of the clinical picture.

It is unnecessary to mention that the anginoid syndrome may be simulated closely in neurotic individuals, particularly in heavy smokers, and notably in those who have had occasion to observe attacks in friends or members of the same family, by crises which

may give more or less anxiety to the physician as well as to family and friends.

Nevertheless, in the majority of instances the physician who studies his patient carefully is able, in the individual case, to arrive at a reasonably accurate diagnosis as to the nature of the pathological lesion. Syphilitic aortitis may usually be recognized, and in most instances the attacks of pain which time proves to be unassociated with vital lesions are separable from the anginas of graver import.

The recognition of the anginal syndrome is but the beginning of the physician's responsibility. He must seek to determine its pathological basis upon which rest the hopes for the future, the treatment and the prognosis.

The prognosis, happily or unhappily, as the case may be, is always uncertain.

Why is angina so important a syndrome? Because it is the outward and visible evidence and often the only evidence of changes in the organism which are generally fatal within a relatively short period of time and because of the dramatic character of a common fatal issue—sudden death, the most sudden that we know.

What are the pathological changes with which the syndrome of angina is associated? This is a subject about which there is still considerable controversy—witness the long and interesting discussion of the subject in Allbutt's work on "Diseases of the Arteries."

Certain things, however, we know. We know that characteristic symptoms of angina may accompany the sudden or gradual occlusion of important branches of the coronary arteries, even though the same pathological changes may be found in patients who gave no history of pain.

We know that in a large proportion of instances of angina, disease of the coronaries is found at necropsy, narrowing, obstruction or obliteration which has been associated with secondary cardiac changes—infarct with myomalacia or more gradual atrophy and subsequent replacement by scar tissue.

We know that very similar pains may occur in disease of the root of the aorta.

We know that anginoid pains may occur in aortitis, usually syphilitic, and associated with aortic insufficiency or with aneurysms. Sometimes, as in five of our cases, the changes in the aorta are

associated with constriction of the coronaries, but in other instances there is no obvious coronary disease. In these latter cases the nature of the process—syphilitic aortitis—is generally recognizable from the history and the symptoms. There is usually evidence of lues and of dilatation of the aorta.

In other words, we know that the syndrome of angina is generally associated with coronary disease and its sequels or with disease—syphilitic in the great majority of cases—of the root of the aorta.

The nerve supply of these regions is apparently essentially the same: (1) The depressor fibres of the vagus; (2) sympathetic filaments passing through the inferior cervical ganglion and entering the cord by the posterior roots corresponding to the eighth cervical and first and second thoracic nerves. Stimulation of these fibres results, through a viscerosensory reflex, in pain along the course of the sensory nerves entering by these same roots, *i.e.*, mainly the circumflex, internal cutaneous and radial.

My own experience accords with that of Osler that in the majority of instances of outspoken angina there is well-marked coronary disease.

In the Johns Hopkins Hospital and in my own practice there have been twenty-four cases of angina pectoris with necropsy.²

Among these twenty-four cases:

In 14, coronary sclerosis was the only lesion. In all but one of these there was marked narrowing or occlusion of important branches.

In 4, luetic aortitis was the only obvious lesion.

In 5, there was luetic aortitis with coronary disease; in all but one marked stenosis of one of the main vessels or an important branch.

In 1, there were myocardial scars but no note as to the condition of the coronaries.

² These figures alone are interestingly significant of that which has been said above as to the infrequency of angina in general hospitals. It is certain that were one to search the pathological records for instances of coronary disease and luetic aortitis and then to reconsider and scrutinize the histories of these patients there would be found many in which there is a story of anginoid pains unrecognized during life and unrecorded in the history. I desire to express my thanks to Professor Longcope for his permission to use these figures which in the great majority of cases relate to patients that I have observed myself.

In twenty-four cases of outspoken angina pectoris with necropsy there was a high degree of coronary sclerosis in nineteen, in all but two of which there was grave stenosis or occlusion of a main vessel or an important branch; in but nine was there a luetic aortitis, and in more than half, five, of these there was an associated coronary disease.

Fifteen or twenty years ago, in conversation with a wise old teacher, I remarked that it was always depressing to meet with an instance of angina; there was so little that one could do. "On the contrary," said he, "there's a great deal you can do. There are many things worse than angina. Angina is one of the conditions in which I look forward to doing a great deal for my patients."

He was right. There is much to be done for many patients with angina, and the prognosis for a fairly long life and usefulness is by no means uniformly bad.

The prognosis and the treatment vary according to the nature of the case.

CLINICAL FORMS OF ANGINA

Angina occurs in several rather characteristic forms:

(1) *Those cases which begin with severe paroxysms coming as it were out of a clear sky, which are followed by evidences of rapidly developing cardiac failure—in other words, cases that suggest a sudden coronary occlusion.*

Let me give you a few examples.

CASE I.—L., a business man in the sixth decade, on the morning of August 2, 1911, while in his office, was seized with severe pain of a peculiarly sickening character in the præcordial region and radiating down the left arm. This persisted with increasing severity until at about luncheon time, he was brought to my consulting room, ashen pale with an expression of great suffering and anxiety. The skin was moist and rather clammy; the peripheral arteries, soft; the pulse, rather small, 120-130, regular; heart not notably enlarged; first sound, split. At home in bed, the pain, not very acute but of a sickening character, persisted despite repeated doses of morphine. The face was pale and anxious; the pulse persistently rapid. On the fourth a soft to-and-fro *friction murmur* was audible over the præcordium. On the sixth, the pulse was more rapid and irregular. There was increasing cyanosis, and about noon, four days after the onset, the patient died.

In this case the course of events was perfectly clear: Coronary disease, occlusion of a large branch; infarction of the heart wall;

myomalacia; pericarditis over the affected area; weakening of the heart muscle so great that it failed to react from the shock.

CASE II.—R., a physician, aged 39. Eight years previously, a severe septicæmia. In January, 1911, after an influenza, was seized with a sudden intense præcordial pain associated with dyspnoea. His physician recognized a failing heart with mitral insufficiency. Five weeks in the City Hospital was followed by little improvement although the pains ceased. A week later when I saw him, the heart was somewhat dilated, there was a mitral systolic murmur and a protodiastolic gallop at the apex, a swollen liver and œdema of the dependent parts. He was removed to the Johns Hopkins Hospital where he failed rapidly. There was hæmoptysis on several occasions with thoracic signs suggesting pulmonary infarction. Death followed a little less than three months after the initial attack.

Here, again, the course of events indicated clearly the sudden occlusion of a coronary artery with cardiac infarction and damage to the heart so grave that it never recovered from the insult.

The necropsy wholly supported the diagnosis: Marked coronary sclerosis with occlusion of the large left descending branch; infarction involving the lower part of the ventricular septum which in areas was replaced by a thrombus extending into each ventricle; from this thrombus mass emboli had resulted in pulmonary infarctions.

The initial anginal attack, as was recognized during life, was evidently associated with coronary occlusion followed by the development of the infarct, weakening and dilatation of the heart, mitral insufficiency, the formation of mural thrombi over the softened heart muscle and subsequent pulmonary embolism.

CASE III.³—H., aged 65, a patient of my friend, Doctor Paullin, of Atlanta, an active man of affairs in his seventh decade, emphysematous and hypertensive, with evident cardiac hypertrophy, had suffered off and on for a year with dyspnoea on exertion and at night, and Cheyne-Stokes respiration.

On October 5, 1916, he was seized with an attack of excruciating pain in the præcordial region radiating into the left arm, left back and right forearm. This was followed immediately by dyspnoea and Cheyne-Stokes respiration.

On October 8 there was a sudden numbness of the right leg, tingling and paræsthesia in the right foot gradually ascending to the knee. The leg felt cold and clammy. When Doctor Paullin saw the patient the right leg was cold and the pulsation, though present in the femoral, was lost in the dorsalis pedis. The leg became discolored and gangrenous to the knee.

The heart enlarged; a systolic murmur appeared at the apex. The pulse became rapid and irregular; there was auricular fibrillation, and a well-marked protodiastolic gallop became audible. There was deep cyanosis, and, ten days after the onset of his symptoms, he died.

³ This case has been reported by Doctor Paullin (*Southern Medical Journal*, Birmingham, 1921, xiv, 16-21).

I saw the patient on the evening of his death with Doctor Paullin. Our diagnosis, written before death, was: "Coronary sclerosis and thrombosis; cardiac infarction; ventricular mural thrombi; embolism of the right common or external iliac artery." This was confirmed at necropsy which revealed a high degree of coronary sclerosis with thrombosis of the ramus descendens of the left coronary and extensive infarction of the heart involving the apices of both ventricles, with mural thrombi in each cavity. From these thrombi, obviously, had arisen the embolus causing the gangrene of the leg. There was considerable general arteriosclerosis.

CASE IV.—W. M., a rather fat colored gardner of fifty-five, with slight peripheral and retinal arteriosclerosis, an enlarged heart and aorta and moderate hypertension, was seized, six weeks before death, with sudden, intense præcordial pain coming on while walking and disappearing with rest.

Three weeks later and again four days thereafter there were like attacks followed by dyspnœa and palpitation. Several days later, while in bed, there was a very severe attack. This was associated with orthopnœa which was but partially relieved by morphia. On April 28, 1921, he was admitted to the hospital. After two weeks of comfort at rest, the patient was seized at night with an attack of agonizing præcordial pain unrelieved by nitrites but somewhat helped by two doses of morphia, gr. 1/4. The pulse became rapid, the extremities cold, œdema of the lungs set in, and death followed fifty-eight hours after the onset of the attack.

My notes on the case read, "a rather characteristic story of anginoid pains with sudden cardiac failure following a severe attack with *status anginosus* and death fifty-eight hours later. Such a story usually means coronary sclerosis and narrowing with a terminal thrombosis of an important branch and infarction of the heart muscle so extensive as to cause a fatal result before sufficient compensatory circulation can be established."

The necropsy confirmed the diagnosis. The coronary arteries showed extensive sclerosis and narrowing with wide-spread areas of necrosis and infarction of the ventricular wall. There was moderate generalized atheroma of the aorta, not extensive, not of a syphilitic type. There were no evidence of lues.

These four cases present a definite and not uncommon clinical picture—sudden severe angina followed by immediate cardiac failure and evident infarction of the heart muscle—pericarditis (Case I); embolism revealing mural thrombi in Cases II and III; rapid failure of heart (Case IV).

(2) *The commoner story—the ordinary story—in angina is that of a gradual onset of attacks of moderate intensity on exertion, increasing in frequency and severity and eventual death from gradual cardiac failure or in an attack. Commonly death is so sudden that the manifestations of a paroxysm have not time to appear.*

The following is a characteristic example:

CASE V.—H., aged fifty-one, a banker, a rather heavy eater, who took insufficient physical exercise, but otherwise a man of good habits who had never had syphilis, began in December, 1906, to suffer from a sense of constriction across the chest on climbing hills. This always disappeared with rest. Soon, however, the sensation became a real pain. He had to give up walking fast; he dared not. The heart was a little large, the maximum blood-pressure, 150. Gradually his disability increased; the attacks became more frequent, occurring after meals without apparent cause. In August, 1908, at the end of a course of baths at Nauheim, he suddenly dropped dead.

The necropsy showed: "Extreme stenosing sclerosis and atheromatosis of the coronary arteries, obliteration of the left horizontal and descending branches as well as of the right posterior horizontal branch. Extensive atheroma of the aorta throughout its course. Extensive peripheral arteriosclerosis."

CASE VI.—H. H., Gen. No., 154,366, Med. No., 47,243, Path. No., 6961, a patient of Doctor Barker, a civil engineer, began five years before death to have pain and pressure across the chest on exertion and an aching in the arms. Six months ago these pains became more severe, radiating into both arms and to left side of the neck. The attacks were associated with a distressing sense of impending death.

On admission to the hospital the heart showed no essential abnormalities. At the time of his initial examination on March 9, 1922, he had a paroxysm of pain during which the pressure was 180/110, falling with its recession to 110/80. Despite rest the attacks became more frequent and distressing. Nitrites, which had given relief, lost their effect. Finally, he passed almost into a *status anginosus* in which he was obsessed by the conviction that he was dying. The pulse grew gradually weaker, the skin cold and clammy, the respiration deep and gasping, and on April 9th he died.

The necropsy revealed an extreme degree of obliterative endarteritis of the coronaries, which, in several places, especially in the large left descending branch, were almost completely occluded; there was extensive sclerosis of the heart muscle.

CASE VII.—T., a University professor of exemplary habits, began, at about sixty-nine years of age, to suffer from a slight gripping præcordial discomfort radiating as a lame, tired feeling, into his left arm. At first these sensations

were observed only when walking briskly after meals or carrying a heavy bag of books, but gradually they grew more frequent so that he was often obliged to stop on his way from his house to his lectures. The peripheral arteries were rigid. One day, about three years after the onset of the symptoms, while sitting at the breakfast table, he died without a movement or a sound. There was no necropsy.

This is the common story—attacks gradually increasing in frequency and severity and often ending in sudden death with or without evidence of myocardial insufficiency in the sense of cardiac dilatation and its sequences.

(3) *There is another group of cases, generally instances of hypertension and cardiac hypertrophy, in which, with the development of dilatation of the heart and failure of the muscle, anginal attacks disappear, and the patient passes through the ordinary train of symptoms associated with a failing dilated heart.*

Two examples of this train of events may be cited:

CASE VIII.—K., a plethoric, gouty physician of forty-five, was seized on May 24, 1903, with a sensation of weakness and aching in both of his legs, and a feeling of great fulness in his chest; later there was a "gripping, twisting pain" in the præcordial region associated with a sense of impending death. Nitrite of amyl relieved this attack and similar attacks occurring during several succeeding days. On the night of May 25 there was a very severe attack relieved only by repeated hypodermics of morphine. On the following day the pulse was rapid, 120 to 130, the heart, little if at all enlarged; there was a soft systolic murmur at the aortic area and a very loud ringing second aortic sound. He was practically in a *status anginosus*. The blood-pressure was extremely high—too high at times to be estimated by the old-fashioned Riva-Rocci instrument with a narrow (3-inch) band. Once it registered a maximum of over 340 mm. After a long rest the attacks, which sometimes began in the arms and spread to the chest, diminished in frequency and, in September, the patient resumed his work. But in a little over a month symptoms of decompensation set in and a year after the onset of his symptoms he was brought to the hospital with a dilated, insufficient heart, orthopnoea, dropsy of the dependent parts, mitral insufficiency and a swollen liver. He lived six or eight months. Never from the time of the onset of cardiac dilatation was there a recurrence of the pains. There was no necropsy.

Here it may well be that the onset was associated with a sudden coronary occlusion.

CASE IX.—J., a University professor, aged fifty, began about Christmas, 1908, to have pain in the axilla and across his chest on walking. At times he waked up suddenly at night with pain running down the left arm to the elbow. No actual dyspnoea on exertion but occasionally a fluttering sensation.

The pains gradually grew worse so that sometimes he had to stop in the middle of a lecture or on the street.

The heart was enlarged, the second aortic, sharp; there was a protodiastolic gallop; the pressure was high, 160/120. The pains continued with longer and shorter remissions until in September, 1909, after a walk in the face of a strong wind, he had a severe attack which lasted thirty-six hours after which dyspnœa on exertion and orthopnœa set in.

Three or four weeks later the heart was dilated; there was a well-marked mitral insufficiency; the maximal pressure was 180; the liver was 7.8 cm. below the costal margin. There was temporary improvement with rest in the hospital, but the dilatation increased, œdema of the dependent parts and ascites set in, and for five years he was confined to his room, orthopnœic much of the time, with extreme dropsy. He died in July, 1914, after a respite of six years from anginoid pains.

(4) *There are those instances of syphilitic aortitis usually with hypertension and beginning with nocturnal paroxysms of restlessness, anxiety, suffocation and orthopnœa—"cardiac asthma"—in which, at times, actual pains, præcordial and radiating into the left arm, may justify their classification as angina. There is generally evidence of aortic dilatation, aortic insufficiency and hypertrophy and dilatation of the heart, and the suffocative symptoms are usually the indication of beginning cardiac dilatation—pulmonary œdema.*

As I have already said, I have not usually regarded these symptoms, if unaccompanied by pain, as angina pectoris. Some instances of syphilitic aortitis, however, through occlusion of the mouths of the coronaries are followed by secondary changes in the heart walls and give rise to a true coronary angina.

The following cases are examples of angina depending on syphilitic disease of the aorta. All three of these cases are referred to by Osler in his "Lumleian Lectures" on angina pectoris.⁴

CASE X.—W. A. M., aged thirty-eight, Med. Nos. 4722, 4972, a watchmaker, had had typhoid fever at the age of twelve and syphilis at sixteen. Two years before his entry into the hospital he had begun to have paroxysms of dull præcordial pain which radiated across the chest and down both arms. The attacks were nocturnal and lasted as long as two hours and a half, keeping him awake. Recurring at first at intervals of about a week, they had gradually increased in frequency until they occurred daily and were accompanied by dyspnœa.

On February 21, 1895, the day after his admission, I found the heart moderately enlarged, the pulse collapsing, and evidences of aortic insufficiency. He was ordered increasing doses of iodide of potassium beginning at gr. xx, t.i.d.

On March 25 he had a "severe attack of angina, became pale, cried out with pain in præcordium and both shoulders and arms, particularly the left; numbness of fingers of left hand; sense of impending death." After three months

⁴ *Lancet*, London, 1910, i, 697.

in the hospital he was discharged slightly improved, but returned in four days complaining of the same pains, of dyspnœa and vomiting. The paroxysms come after he lies down. He had the sensation that his heart was being tightly squeezed; the pain shot down both arms, especially the left.

There was epigastric soreness and frequent short attacks of dyspnœa. Morphine gave little relief and early on the morning after admission he died. At necropsy (No. 665) the aorta throughout was the seat of a nodular endarteritis with some calcification. The aortic valves were thickened and retracted. The coronary arteries were delicate.

Although the description of the character of the aortic changes was not very definite, the clear history of lues and the general picture justify a diagnosis of syphilitic aortitis. Here the nocturnal attacks and the absence of the common story of the relation of effort to pain are striking.

CASE XI.—J. W., aged thirty-three (Med. No. 7403), a colored farmer, was admitted to the hospital on June 8, 1897. At twenty-one, pains in knees and ankles of several days' duration. Syphilis at twenty-four. Vague history of præcordial pains off and on for several months. Two weeks before entry, while walking home from work, he was seized suddenly with pains in his arms, eructations and a tingling, dizzy sensation followed by unconsciousness which he thinks lasted half an hour (!). Thereafter any exertion brought on similar attacks—pains in his arms, eructations, a sense of a load in his chest and unconsciousness lasting fifteen minutes—dyspnœa on exertion and a sense of weakness in his left arm. Nothing striking was made out on physical examination. There was nothing remarkable about the pulse. He was given increasing doses of iodide of potassium. Doctor Osler and others noted a protodiastolic gallop. On June 10, two days after entry, he vomited and complained of coldness of hands and feet. An ice-bag was applied to the præcordium. A few minutes later he threw up his arms and, with a slight exclamation, died. The necropsy showed a dilated right heart. There was an extensive aortitis which must have been syphilitic. The coronary arteries were described as "delicate."

Here the anginoid attacks were clearly associated with effort. Although no note was made of a slow pulse, this may have been an instance of heart-block.

CASE XII.—A. P., a colored stableman, aged thirty-nine, Med. No. 16,823, was admitted to the hospital on March 9, 1904. He had had typhoid fever at twelve and arthritis in feet and legs ten years before entry. He acknowledged syphilis. For three months he had suffered from aching pain on exertion over the lower sternum accompanied by dyspnœa. The attacks, paroxysmal, had been increasing in frequency. The pain radiated up over the sternum and down the arm and lasted about fifteen minutes. It had become impossible for him to walk "any distance" because of pain and dyspnœa. Sometimes the pain came after meals without effort; sometimes, without apparent cause, in bed. He was, at the time of admission, having as many as three to four attacks a day. The heart was

much enlarged. There was a soft systolic murmur at the apex. The maximal blood-pressure was 180.

On evening of March 10 he had a severe attack relieved by nitro-glycerine. Several hours later—again severe pain; vomiting; sweating; pulse rapid; unconsciousness; noisy râles throughout chest; death in three hours.

Necropsy: Chronic mitral endocarditis—marked aortitis of the ascending arch involving the mouth of the left coronary which is not more than 1 mm. in diameter. Some fibrous areas in the heart muscle. Little coronary sclerosis.

This is an example of characteristic angina of effort depending on luetic aortitis associated with coronary narrowing. A striking feature of angina depending on luetic aortitis is its occurrence at a relatively early age.

The average age of fifteen patients dying from pure coronary angina⁵ was 55.3; of nine patients with angina depending on luetic aortitis, 38.3.

This is but natural. Coronary sclerosis develops with age; it is rare before the fifth decade. Syphilis is a disease of youth and early manhood.

Let us now consider what we may expect from the treatment of angina.

PROGNOSIS

The first question that one naturally asks is as to the prognosis. What is the outlook? This naturally depends on the character of the lesions.

And first we may consider that group of cases in which one is justified in assuming the existence of a sudden coronary occlusion with cardiac infarction. Grave as may be the outcome, sudden death or rapid cardiac failure, there are instances in which recovery for long periods of time may follow proper treatment at the outset. The coronary arteries are not strictly terminal vessels. There are anastomoses though small and there is abundant evidence that in some cases of grave occlusion a compensatory circulation which is reasonably satisfactory may be established with restoration of functional efficiency for long periods of time. Moreover, if the initial symptoms be not fatal, considerable areas in the heart muscle may

⁵ This includes the one instance above referred to in which there was a fibrous myocardial change without note as to the condition of the coronaries.

soften and be replaced by scars with relatively little disturbance of cardiac function.

We have spoken of several instances with a rapidly fatal course. Let me add a few with a wholly different outcome.

CASE XIII.—A. W., a physician, aged forty, had had on several occasions a sense of fullness in his chest on walking which disappeared as soon as he stood still. Once, in 1896, he had a sharp attack while walking for which he had to go into a neighbor's house and rest, and two days later, a severe paroxysm with the sensation that his chest was going to burst asunder, and continued pain for eight hours. On Doctor Osler's advice he took a complete rest of several weeks. The attacks ceased. Thereafter he was careful not to attempt any undue physical effort but continued in active medical practice for thirteen years without further symptoms. Then, however, he began again to suffer from like pains after dinner and when walking. The pressure and sense of tension abate when he "lets up and walks slowly." At this time, when I first saw the patient, his heart was somewhat hypertrophied; there was hypertension and a ringing second aortic sound. The attacks became more frequent; he was somewhat short of breath, and, within two years after the reappearance of his pains, he suddenly dropped dead.

The proof that the initial severe attack was due to coronary occlusion is wanting, but that this was the case is highly probable. Rest and a vacation at the outset, and a careful and prudent life thereafter, were followed by a complete remission of the attacks for thirteen years during which the patient continued his professional career.

CASE XIV.—S. E. B., aged forty-five, (Med. Nos., 39,553, 45,395), a colored laborer, began, in the early part of 1918, to suffer from pain in the præcordial region radiating into the left shoulder. In the latter part of February, after physical effort, he suddenly became very short of breath. There was epigastric pain and œdema of the dependent parts. Two weeks later, on March 11, he entered the hospital. The heart was enlarged, the pulse, 96, the blood-pressure, 180/140; there was a presystolic gallop; the liver was enlarged and tender, and there was free fluid in the abdomen. The urine suggestive of a chronic passive congestion, contained red blood-corpuscles in the sediment; these disappeared with recovery. There was no evidence of syphilis. Ten days after entry there was a sudden right hemiplegia with motor aphasia; no loss of consciousness. After five weeks he was discharged well. The hemiplegia and cardiac insufficiency entirely cleared up.

For nearly three years he remained well and able to perform the work of a day laborer. In January, 1921, however, he again became short of breath; there was a hacking cough and œdema of the dependent parts. The swollen legs burst; large ulcers formed, and bed-sores appeared on the buttocks. There was grave anæmia. He was brought to the hospital on April 23, 1921 (Med. No. 45,395). The heart was enlarged *but not so much as on his entry three years before*. There was a systolic murmur at the apex. Three days after entry he died.

In a word, anginoid pains three years before, with sudden cardiac failure and cerebral embolism. Complete recovery following rest in the hospital. Good health for nearly three years, when signs of cardiac dilatation set in followed in three months by his death.

At necropsy there was found a general arteriosclerosis, not of the syphilitic type. Extensive sclerosis and narrowing of the coronaries. The apex of both ventricles and the lower part of the septum was replaced by a mass of cartilaginous-looking scar tissue, clearly the result of an old cardiac infarct with organized intraventricular thrombi.

The course, as recognized and recorded in writing before the necropsy, was clear: Coronary occlusion, myomalacia cordis, extensive intraventricular mural thrombosis with cerebral embolism. Complete symptomatic recovery with extensive scarring of the heart wall and a period of respite of three years' duration during which the patient was able to continue his work as a laborer.

CASE XV.—S. B. W., aged thirty-three, seen in consultation with Doctor Van Ness, began on January 20, 1910, to have a peculiar feeling in the præcordium with eructations and pain coming down into his wrists. The feeling in the heart was "not a pain but an agony, a grab." This lasted about twelve hours. He remained in bed feeling "bruised and sore." The pulse was accelerated. After three days he resumed his work as a life insurance agent. On February 1 again he had an uncomfortable feeling in his epigastrium which once more he described as "not a pain but an agony." He felt as if it might be relieved by defecation, but it was not. He was nauseated. At this time when I saw him, the sensation had been continuous and uninterrupted for several days. The heart was somewhat enlarged. The pulse, 108; maximal blood-pressure, 133-140. He was kept in bed at rest. Four days later, on February 5, 1910, suddenly, while at stool, the legs became numb, and in five minutes he was completely paraplegic. On the following day the paralysis was much better, but there was a sudden attack of pain in the left leg, lasting several hours; it felt "as if 'twere going to burst." Doctor Van Ness found the extremities pale and cold. The knee-jerk was present on the right, absent on the left. No pulsation could be made out in either posterior tibial or dorsalis pedis. He could barely move his toes; no other movement possible. In the hospital on February 9 there was fever, 100-101°; pulse about 106, regular; blood-pressure, 124/86; leucocytosis, 12,200; retinal vessels, slightly sclerotic; Wassermann, negative; urine, 0.1 per cent. of albumin with red blood-corpuscles and hyaline casts in the sediment. The temperature gradually fell to normal; power rapidly returned in his legs; pulsation returned in the arteries of the left foot. A month after entry, on April 8, he was discharged free from cardiac symptoms or signs of his paraplegia save for a little weakness in his left leg.

On leaving the hospital he took a vacation of five months, resuming work in September. The heart had diminished a little in size and showed no obvious abnormalities. He was able to play a little golf. But occasionally when walking there was a slight "agony" in his chest, stopping so soon as he rested. For the following eight years he was able to attend to his business and lead an essentially

normal life when careful to avoid physical and mental strain. In 1918, however, the attacks became more frequent and severe. In some, large amounts of morphine failed to give relief. After several months he died suddenly at night. There was no necropsy.

The course of events here was obviously: Coronary disease; occlusion of a large branch; infarction of the heart wall; intraventricular thrombosis (left ventricle); dislodgment of large embolic masses resulting in embolism of kidneys, spinal cord, both iliacs and later the left femoral; complete symptomatic recovery, with reestablishment of cardiac efficiency to such an extent as to be compatible with eight years of active business life; eventual return of anginal symptoms with sudden death.

It must be recognized, then, that coronary occlusion grave enough to result in extensive infarction of the heart wall with all its sequels may be compensated for to such a degree as to be followed by years of relatively active life, provided that at the outset the heart be spared all strain and that thereafter the life be properly regulated.

The same is true in some instances where the angina begins more gradually and lacks in the beginning, at least, the stormy symptoms suggestive of a cardiac infarction.

CASE XVI.—S., aged forty-eight, engineer, with heavy responsibilities as a railroad official, began, in 1913, to suffer from a sense of tightness across the front of the chest on effort. Nothing abnormal was detected on examination of the heart. In the fall of 1914 there were severer attacks, pain like a red-hot iron radiating down his left arm and, to a lesser extent, his right. On November 29 there was a severe attack relieved by amyl nitrite. He entered the hospital where the pains recurred at times even in bed on very slight effort. During an attack the blood-pressure rose from a maximum of 110-120 to 160-170. After ten days of treatment in the hospital with rest and massage, he was sent to Clifton Springs under the care of Dr. Roger S. Morris, where the treatment was continued. The next five or six months he passed in the South, very gradually resuming normal physical activities. He resigned his position in the railroad and took up work in the fall as a consulting engineer. He has followed directions scrupulously and has been able to lead an active professional life for nine years. He has resumed golf in moderation and while he says he has had some warnings if he pursues his exercises too far, he has had no further definite attacks.

There is thus, even in cases which at the outset seem most ominous, a fair chance of symptomatic recovery or great improvement persisting for considerable periods of time. The realization of this truth by the physician is an arm of the greatest value in the treatment of angina pectoris.

It should then be remembered that the lesions resulting in the syndrome angina pectoris may be compatible with a relatively long and useful life. If it be true that many patients subject to angina die eventually in a paroxysm, this is by no means always the case,⁶ and at all events, the fatal issue may sometimes be long postponed by a suitable manner of life and a proper mental attitude.

TREATMENT

If the patient be an intelligent man it is almost always—and when I say this, I mean it literally—it is almost always well to explain to him in simple language just what one thinks of the nature of his trouble. I do not mean necessarily to use the words “angina pectoris”; that may be wholly unnecessary, nor do I mean that it is necessary to explain to him the possibility of sudden death, that might be foolish. If, however, the patient asks you directly if it be angina pectoris, or if there be danger of sudden death, do not lie to him. It is generally easy for the physician who is willing to give the time to tell the truth however sad it may be, and, at the same time, to lift up and help his patient. Often it takes time, but that time it is his duty as a physician to give.

“But,” one may ask, “how can you tell a patient who asks you the direct question that he has angina pectoris and at the same time cheer him up?” If he asks you the question, that man has feared the worst, and you can answer cheerfully: “Yes, that is angina, but what does angina mean? Angina, like a great many other maladies, may have every degree of severity. What you have had is, in a sense, a warning signal—yes, but it is not a ‘smash-up.’” And then explain to him the course of life that may give him a fair chance of practical recovery or long respite. Tell him of the favorable instances you have observed. Interest him in the sort of life he ought to lead and, above all, make him realize that he will not have to lead the life of an invalid and must not, if it be not absolutely necessary. He has a handicap; he must so adjust his life that, so far as he can, he keeps below the danger point—at least the pains. As Shattuck epigrammatically used to put it, he must “live up to the level of his heart.” But this does not mean that he must abandon his

⁶Sudden death occurred in but eight of our twenty-four cases of angina with necropsy.

responsibilities, or give up his occupation or his profession. And when this is said to him in a truly encouraging way, you have sometimes made a new man of a poor wretch who was half resigned to sit down and await death.

I like to compare the problem that confronts such a patient with that which confronts an athlete training for a race. The athlete "goes into training," avoids all excesses, regulates his diet and his habits of life. He takes, in measured doses, as it were, a daily increasing amount of exercise until his normal heart and muscles are trained and hardened so as to be able to stand exceptional strain. The patient's problem is very similar; it differs only in degree. He begins, handicapped with a damaged heart, at a lower point, and the goal that he may hope to attain is not the ability to indulge in exceptional effort but the ability to assume responsibilities involving an amount of physical and mental effort compatible with a reasonably normal life—responsibilities such as may permit him to do his duty to his family and his profession or business.

REST

In the beginning, if the attacks have been sudden and suggestive of coronary occlusion, with the danger of immediate cardiac failure, rupture, or the development of an aneurysm, it is necessary to start with a long period of rest in bed. And the same is wise in any case in which the attacks have begun to recur with frequency. It should be explained to the patient that for the next several months he must put aside his business cares and devote himself whole-heartedly to one object, his systematic physical reconstruction. If possible he should be sent to a hospital where he may be controlled and protected from unnecessary physical and mental effort. If this cannot be accomplished he should be placed under the care of trained nurses at home. The rest should be absolute—in bed. The patient should not be allowed to walk to the toilet. He should use either a bedpan or a bed-side commode. It should be explained to him that the object of this rest is to save every heart-beat until any acute lesions are healed and such compensatory circulation as be possible may be established. During this period he need not, of course, be isolated, but his visitors should be limited and he should not be allowed to

conduct business or discuss annoying affairs. This is an important matter.

The diet should be limited in amount and character according to the individual. With the ordinary man it should not exceed the caloric necessities for the patient at rest. If, on the other hand, he be obese, the effort should be made to reduce him to a suitable weight—a very important point. The removal of superfluous fat takes a material burden from the heart.

It goes without saying that careful attention should be paid to the *primæ viæ*. The patient should not be purged, but habits of regularity should be established and maintained, if necessary, by means of the addition of agar agar in sufficient quantities to the diet or by the administration of mineral oil, or both. At the outset or from time to time, plain or glycerine enemata may be given, but only at the hour chosen for the regular daily action of the bowels. The manœuvres, dietary and physical, which should be entered into to induce regularity need not be discussed here. Lyon ⁷ has summed up these procedures admirably.

The rest should always be associated with systematic general massage. This again is of importance. If a suitable masseur or masseuse be unobtainable, let the nurse or attendant or servant or some member of the family give the nearest approach possible to massage in the shape of one-half to one hour of general rubbing daily. It is easy to give a little instruction in simple manipulation to the attendant. If the muscles of the patient be not carefully attended to the value of the rest is largely lost, for when he begins to move about again, though his heart may have gained reserve power, the strength of his muscles, atrophied by disuse, is to such a degree impaired that the effort demanded of the heart is materially increased. It is a vicious circle.

It is a reproach to our profession in America that the procedures of physical therapy—massage, exercises, the use of water—are almost neglected in our schools of medicine. The average physician entering on practice is not only unable to use his own hands or to direct proper methods of physical culture, he is often distressingly ignorant of what may be accomplished thereby. Hence the success of osteo-

⁷ *Tr. Asso. Am. Phys.*, Phila., 1908, xxii, 482.

paths and the like who, with little fundamental knowledge, acquire considerable manipulative skill, and, if possessed of a reasonable modicum of common sense, become useful members of the community. If possible, massage should be given daily, if not, at least every other day. On the intervening days, in connection with a warm sponge bath at night, the nurse should give a brisk general rubbing.

The period of rest in bed should be at least four weeks. During this period the patient may sit up with a back-rest and read or play simple games or indulge in such manual occupations as knitting, drawing, basket-making, painting, and so forth.

At the end of four weeks he may begin to sit up for short periods of time, increasing very gradually. At this time it is usually well to begin a simple series of calisthenic movements to exercise the various muscles of the body. These exercises should be begun very carefully. They may be copied from the Schott methods or from some such book as J. P. Mueller's⁸ or they may equally well be devised by the physician for his patient. Later some of the resistance movements of Schott may be instituted.⁹

When he first sits up the patient should not be allowed to dress, and it is generally only after a week of sitting up in a chair that he should be allowed to walk. The amount of walking should be increased very slowly and six weeks should generally have passed before stairs are attempted and then very slowly and carefully. The period of hospital treatment should last eight weeks.

This should be followed by at least a month of after-treatment at some such place as Atlantic City, which is an ideal spot because of the opportunities offered by the Boardwalk for exercise on a level or a gradual incline.

With many patients such treatment is followed by a disappearance of the symptoms. If there have been acute changes, they have passed, and so far as possible are compensated for.

During the course of this treatment, and later, every attempt should be made to bring the patient's health into the best possible condition. A careful search should be made for any focal infections which may influence the general health. It may well be that the coronary arteritis which induces many instances of angina may be

⁸ "My System," Phila., McKay, 1905.

⁹ Camac, *J. Hopkins Hosp. Bull.*, 1897, viii, 101.

fundamentally dependent on general infection arising from some unsuspected focal infection. We were much impressed years ago by an acute arteritis of the large descending branch of the coronary found at necropsy in a fine, strong young physician in his twenties dying on the nineteenth day of a typhoid fever. Encircling the vessel the process might easily, with regressive changes, have produced a grave stenosis. But apart from any possible specific effect of this sort, there is no doubt that the general depression of the system so strikingly relieved sometimes following the removal of local foci of suppuration may predispose the individual subject to angina to attacks.

The accessory sinuses, tonsils, teeth, should be put in the best possible condition and kept in good condition. *Fistulæ in ano*, chronic aural infections, any foci of chronic suppuration should, if possible, be eliminated.

Then comes the important problem of the regulation of the after-life. For men engaged in occupations very strenuous mentally or physically, the situation may be difficult. Where possible such a situation should be met as it was by the engineer (Case XVI). Chief engineer of an important railway system, working as the conscientious and much misunderstood railway official does, earning perhaps what may to some seem a large salary by his life's blood, bearing responsibilities of which the general public has little conception, he resigned his position and entered on the practice of his profession as a consulting engineer, thereby saving his life for his family and the public.

The patient must remember that he has to "live up to the level of his heart." He must curb his ambition and he must not allow his conscience and his sense of responsibility to others to warp his judgment. He must turn his attention to his immediate personal and family responsibilities. He must remember that, free from symptoms though he may be for the moment, yet overstrain will probably bring on his pains again. *He must live below the level of his pains.* If one shall have made a friend of his patient, he will probably have so interested him in his vital problem that he will secure proper coöperation.

Excesses of all kinds he must avoid. Excesses in alcohol for what they bring with them—overeating, sexual excesses, and so forth—

although a moderate amount of light wine with luncheon and dinner is harmless.

The regulation of the use of *tobacco* I am inclined to regard as an important point. Men differ greatly in their susceptibility to tobacco. For some men a single cigar is too much. No man with angina who "feels it" should smoke. He who can smoke a pipe or a mild cigar or a few cigarettes after meals—who rests while he smokes—without the consciousness that he has approached the limit of his tolerance for tobacco, may continue without harm and possibly with profit. Tobacco after breakfast rather favors the regular action of the bowels and to many is soothing and calming.

The individual subject to angina should always rest not less than half an hour after meals—sitting in an easy chair or lying down and dozing or reading—not attending to his affairs or working.

Exercise, moderate and below the pain-producing limit, is important. With some riding is possible and very good. Others may indulge moderately in golf on an easy course. With others walking to and from their place of business, not immediately after meals or in the face of the wind or in very cold weather, is the best that can be done.

For all patients massage combined, if possible, with hydrotherapy is helpful. The man confined to his office, the judge on the bench who would otherwise become physically soft, may be kept in reasonably good condition if three times a week he leave his office early and spend several hours at a well-conducted institution for physical therapy where he may undergo a treatment of combined hydrotherapy and massage and rest. In winter time, when the ordinary forms of out-door exercise are impossible, men of affairs should avail themselves of the advantages offered by such institutions.

The subject of angina is often a high-strung, nervous man who, throughout his life, has hurried. He must try to dismount from his horse and watch himself ride by. He must accustom himself daily to observe himself, and, one by one, to discover the occasions on which he hurries unnecessarily. If he honestly try to do this, he will discover in himself all manner of irritating habits of foolish haste from the moment he rises until he goes to bed.

A silly animal is a man in a hurry! Hurry contributes only to inefficiency.

Sometimes the physician may help by calling the patient's attention to some foolish, vulgar, irritating busy-body, and pointing out that he, the patient, has been behaving in the same way. This may be a shock sufficient to produce results. On the other hand, the example of a self-contained, calm, efficient man who is sure to appeal to one's admiration and respect, may be held up as an object of imitation. Happy and fortunate is he who has such a friend by his side!

I have said barely a word about drugs. There is no specific for angina as such. With one exception, drugs are purely palliative. That exception is where there is reason to believe that the anginal syndrome may depend on syphilis. There, immediate and thorough treatment by mercury and iodide of potassium and arsenobenzol should be instituted.

If it be an instance of syphilitic aortitis and there be no evidence of grave cardiac failure, an immediate course of arsenobenzol may be begun. If there be grave cardiac failure it may be prudent to begin by a mixed treatment of mercurial inunctions or injections and iodide by the mouth, reserving the arsenobenzol till later. But the treatment should be thorough and continued.

In the palliative treatment of angina, drugs are important. In most cases, sooner or later, the anginal attacks return. If the return be of a severe form a repetition, more or less complete, of the treatment above described may be indicated. In other cases, gradually and with time, the attacks recur with increasing frequency with effort or mental excitement despite all treatment and precautions.

In many cases the social and financial condition of the patient render thorough initial treatment impossible. To such patients the general course indicated for after-treatment is applicable. But apart from occasional short vacations with physical rest and recreation, the recurring attacks demand immediate temporary relief.

For temporary relief nitrites are the sovereign remedy. The patient should always carry tablets of nitro-glycerine. If at any time he is seized with an attack, immediate rest and a sufficient quantity of nitro-glycerine will, in most instances, give relief. The quantity of nitro-glycerine required varies greatly. With some even gr. 1/100 (0.00065) results in an unpleasant fulness in the head and gr. 1/200 (0.00032) may be sufficient. With others, if not at

the outset, certainly later on, the dose may have to be considerably increased. At the outset, gr. 1/100 (0.00065) is generally sufficient, but the dose may be increased indefinitely and repeated at will. Very large doses do no harm beyond the passing discomfort in the head. I remember an instance in which a patient with syphilis received mxlv (3 c.c.) of *Tr. glonoini* instead of a like dose of the saturated solution of iodide of potassium. It had no other effect than a passing severe headache.

Pearls of nitrite of amyl have perhaps a more immediate effect, but the dose can not so readily be controlled and the patients generally prefer tablets or the solution of nitro-glycerine.

In ordinary cases of angina there is no special value in continued treatment by the nitrites and I have nearly abandoned the regular use of nitrite of sodium or erythrol tetranitrate. The nitrites should be used symptomatically.

In cases of marked hypertension only where attacks are recurring with great frequency, it may be desirable for a time to give the nitrites frequently and in increasing doses to obtain the desired effect. Tolerance is readily acquired.

In severe and continued attacks and in *status anginosus* morphine should be freely administered, but at the outset and wherever the nitrites are of help it is well to move slowly in the administration of morphine; for angina may continue for years in men able otherwise to attend to their affairs, and the morphine habit is all too readily acquired.

As has been said before, especial care should be exercised to support the morale of the patient. As in so many other conditions, the treatment of the family is often the most difficult problem in the care of him who suffers with angina. I am always happy when the patient asks me frankly about himself, for then it may not be necessary to enter into details with the family. It is far better, if possible, to be able to talk with a sensible patient of the possibilities, for instance, of sudden death than with the members of the family who are very likely to ruin his life thereafter by watching his every movement.

If one must (and often he must explain to the family), tact is vitally necessary. Tell them much what you have told the patient. Of course, this is a condition in which sudden death is not uncommon.

But is this necessarily so overwhelming an evil? Before the patient there is a fair prospect of the most blessed of deaths, death, instant, painless in the midst of life and activity, without the common weeks or months of incapacity and suffering and pain and anxiety and care to him and to all about him. For him it will be a blessing. For you alone it is a burden. It may be hard for you to bear. That is your cross. It is your sacred duty to keep a cheerful, unconcerned face. Do not, under any circumstances, allow yourself to watch him or worry him or interfere with his freedom. If for a minute you betray your anxiety to him, you are doing him a wrong. If the patient is able to attend to his affairs and is not suffering from immediate symptoms, if he love travel, his movements should not be hampered. For the family of a patient who has occasional attacks of angina pectoris to interfere, for instance, with a proposed pleasure trip to Europe, is an act of selfishness.

Do not allow his life to revolve around the incident of his death. Do everything in your power to prevent his leading a life of invalidism. Put yourself aside. Think only of him. If you do this you will lengthen his life and prolong his happiness. If you act so as to keep the possibility of his death constantly before his mind you will make his life a burden and you will shorten his days.

Alas! it is not always easy to control the unphilosophical family, but the doctor may do much if he tries.

Angina may be a cruel and a painful malady leading to hopeless invalidism and long pre-mortal suffering. But often with proper treatment the patient may have years of usefulness and happiness in a life to which the excesses of activity alone are denied.

The attacks, though distressing, may often be quickly relieved, and, in the end, the patient may pass from the turmoil of life to the peace of that which we call death in the twinkling of an eye, without a pang, without a movement, without a care.

THOUGHTS ON THE MODERN METHODS OF DIAGNOSIS AND TREATMENT IN DIGESTIVE DISEASES

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IN this article I shall sketch very briefly the trend of work in digestive disorders in the past few years, try to tell you how the newer methods seem to have stood the test of their few years of trial, attempt to point out their inherent virtues or defects, strive to present what seems to me the sane attitude to hold towards them, and at the end turn prophet and sketch some of the lines of thought most likely to be productive of results in the future, as well as reiterate those methods which have stood the test of time and experience.

The subjects I shall briefly touch upon will be the significance of gastric secretory studies; the study of the ferments, especially those of the pancreas, and the study of the bile; the rôle of the intestinal bacteria in disease; certain observations on diet, notably as regards certain forms of headache, hepatic insufficiency and the vitamins; blood chemistry and metabolic studies in digestive pathology; the question of sensitiveness to special foods; the proper attitude to hold towards the X-rays in diagnosis and surgery in treatment; the value of certain special tests; and finally, a rather varied group of observations which have been rather helpful to me in this field. In this motley array of subjects, which I will present of necessity very hurriedly, I shall touch not so much upon the literature or the views of others as upon our own feeling based upon much thought, and the careful study of many years.

THE SIGNIFICANCE OF GASTRIC SECRETORY STUDIES

Ever since Pawlow's epoch-making work, there have been repeated attempts to found a gastric pathology based on secretory findings, Hayem, Matthieu and their followers in France in the late 80's attempting this by means of test meals with the ordinary

tube at repeated intervals, presenting in curves and formulas their findings which they felt of great significance, but the thorough work of investigators in this field, notably in Germany, showed that these findings were not based on firm foundations, and that this procedure gave no more real knowledge than the apparently cruder method—taking a test meal approximately one hour after the giving of the test breakfast. In the past few years there has been a very sincere attempt to revive this method, the using of a permanent gastric tube being the only fundamental difference, but certainly the trend of modern thought within the last year or two seems to be that this method also gives us no results of sufficient value to warrant its routine application for, after all, there are too many variables in this method to make the findings of any greater value than those obtained by the ordinary test meal. In the first place, there are at least three, possibly five, normal groups to compare the special case with. In the second place, there is a great variation in the motor function of the stomach, the amount of fluid regurgitated from the duodenum, the osmotic and transudative processes going on in the stomach, while I have always felt that the psychic element played a very large rôle. Just because Pawlow could put stones in the little stomach of a dog without producing any secretion is, to my mind, no reason why the constant presence of a foreign body in the stomach of a highly organized human being is not likely to produce a flow of gastric juice or of mucus or of both, either due to mechanical irritation or purely psychic in origin. Another variable factor, never to be forgotten, is the amount of saliva secreted simply as a result of the constant presence of the tube—in one of our cases, for instance, we collected nearly a pint of saliva within one hour's time. For these reasons we feel very strongly that all we can hope to get from gastric secretory findings, in a rough way, is the gastric juice approximately normal? is the acid too high? is it below normal or is it absent, and this can be obtained quite as well by the ordinary test meal as by the fractional methods. The passion for objective methods, the passion for curves unquestionably deludes many people into the belief that because a method is associated with these, it is necessarily more scientific. The feeling against putting much reliance on secretory findings is well shown by the fact that in many

clinics, notably certain clinics abroad, gastric contents are no longer studied, and entire reliance is placed upon clinical history, the general physical examination, and the X-ray studies. This, we believe however, is going much too far because a knowledge of the general secretory picture is really helpful not only in digestive diseases, but in many other disorders as well, in addition to the fasting stomach test which we regard as of absolutely fundamental importance as it tells us, as nothing else can, the presence or absence of varying degrees of pyloric obstruction as well as the presence or absence of hypersecretion in that phase of the stomach's activity when it should be relatively empty. In fact we feel very strongly that an ordinary Ewald test meal should not be discarded because we are sure it gives us facts of real value, although we do feel just as strongly that the data obtained by the fractional method does not justify its use except in very rare instances. After all, to our mind medical progress is not measured by amplification of method or by increasing the objectivity of method. It is only measured by the retention of all that is good in the old and the addition only of those newer methods which are based on a firm physiological foundation. To make our point clear that secretory findings based on the ordinary test meal are of value, let us sketch for a moment certain of the conditions in which hydrochloric acid is frequently or constantly absent from the gastric secretion, so-called achlorhydria or anacidity or achylia gastrica. In the first place, it may represent the later stages of a true gastritis, sometimes representing a real atrophy of mucosa with a disappearance of the mucus secretion as well. It may simply represent the gastric expression of a pure psychoneurosis, and may develop gradually under these conditions or suddenly as the result of acute shock. It may represent reflex inhibition from elsewhere as, for instance, the achylia frequently met with during menstruation. It is very frequent in gout and various of the chronic arthritides, and has led in the former instance to the use of hydrochloric acid therapy in the place of the old alkaline treatment; in the latter to the belief held by many of the gastro-intestinal origin of this disease. It may be found in many infections, in the late stages of tuberculosis, in typhoid fever where it is often temporary, but unquestionably is the cause of many of the digestive symptoms in the early months

of convalescence, and probably represents a toxic (temporary) inhibition of function. It is often met with in infections of nose and throat, accessory sinuses and teeth and is the common cause of the diarrhœa of old people with pyorrhœa and deficient teeth. It is a common finding in the various intestinal parasitic diseases, especially in uncinariasis. It is met with in conditions associated with chronic passive congestion, as myocardial disease and in chronic nephritis where there is probably a toxic element involved as well. It is met in pernicious anæmia, and many believe that without achylia the diagnosis of pernicious anæmia is not justifiable. It is found in pellagra and sprue, and in both cases hydrochloric acid therapy is unquestionably helpful. It is met with, as a rule, in cancer of the primary type, that is, without previous ulcer history, sometimes surprisingly early, suggesting that the achylia represents a specific toxæmia and is not due to the extension of the disease or to the associated gastritis. It is peculiarly frequent in diseases of the thyroid, both in hyperthyroidism and in myxœdema, and is certainly one of the causes of the marked diarrhœa, so often present in Graves' disease, and often the only symptom in the early stages. It is met with in linitis plastica which, however, is probably in most cases a very acellular scirrhus. It is found in many cases of high-grade ptosis and atony of the stomach, and, in our experience, is extremely frequent in chronic gall-bladder disease; while in gastric lues, especially gumma of the stomach, it is present in the vast majority of cases, and sometimes increases the difficulty of differentiating the condition from gastric carcinoma.

This is a very large and very interesting group of cases, and if one considers them in detail, one cannot help but realize that the presence or lack of acid is of real help either in diagnosis or in treatment or both. After all, the secretion of gastric juice is a complex mechanism. Various stimuli—psychic reflex, direct stimuli, chemical factors—the hormones—may bring about secretion; while lack of secretion may represent variations from the normal in any of these factors as well as the result of infection or inflammation. Why some of these cases should be associated with diarrhœa, others not, is a question that as yet has not been solved. We have always felt that in certain cases it cannot be explained by the rôle of hydrochloric acid in

digesting connective tissue, in destroying bacteria, in the normal function of the pyloric sphincter, in lessening intestinal infection, or in promoting pancreatic secretion through its effect on prosecretin, but probably represents a certain essential factor in the formation of the motor hormones and motor anti-hormones that control peristalsis. Whether the achylia differ in certain factors is still a moot question. In certain of these, fractional studies are of importance to determine whether the achylia is true or only apparent. Certainly, in our experience, the increase of soluble protein in an achylic gastric content is extremely suggestive of gastric carcinoma, while one of our staff at present is carrying on a very interesting study of the achylia by the use of the hydrogen ion method to determine whether variations in the various achylia, notably in the buffer reaction, may throw some light on the underlying etiology or pathology.

THE STUDY OF THE DIGESTIVE FERMENTS, ESPECIALLY PANCREATIC FERMENTS

We have been singularly interested in the significance of variation in ferments in the digestive tract in various diseases, notably the changes in the pancreatic ferment. In the case of the stomach, as a rule, the quantity of pepsin is proportional to the quantity of acid; the amount of rennin apparently is not proportional to the amount of pepsin, which is, of course, an argument against these two ferments being identical, but in the main the study of the ferments in the stomach has not been of sufficient significance to warrant its employment, while in the case of the intestinal ferments, although we feel that their variations are probably extremely significant, nevertheless their quantitative estimation is so difficult in the majority of cases that, with the exception of Schmidt's fermentative dyspepsia due to a diminution or absence of the starch hydrolytic and sugar-splitting ferments, there are no pathological conditions which can be definitely ascribed to quantitative or qualitative changes in the intestinal ferments. In the case of the pancreatic ferments, however, we know that there is a definite quantitative response, probably a definite qualitative response to food intake. This was shown by Pawlow, and has been substantiated by many investigators since that time. So it would seem to me that if we could get established normal readings in the ferment output, it might be of some value

in disease. A few years ago, under a rigorous technic, we established the normal of the diastase, and, to a less exact extent, of the trypsin of the stool, choosing this more difficult and less æsthetic method because we have always felt that in quantitative determinations it is essential to use the total ferment output and such determinations cannot be made, quantitatively at least, from the duodenal contents. We have studied a number of cases in regard to the quantity of pancreatic secretion, and we have found that in the vast majority of cases of carcinoma of the head of the pancreas and of sprue in its later and more serious stages, there is a complete absence of pancreatic ferments in the stool, while in cases of chronic pancreatitis, true pancreatic cirrhosis as verified by operation, in chronic gall-bladder disease associated with jaundice, and in chronic infectious or wasting diseases of long duration there is likely to be a marked diminution but not absence of the diastase and the trypsin. The effect of jaundice we have also shown in experiments on animals, and we feel, therefore, that if all the controllable factors are standardized, the quantitative study of diastase and trypsin in the stool is of real value in diagnosis, especially in the case of carcinoma of the head of the pancreas and of sprue, probably in the latter disease associated with marked diminution of all the intestinal secretions as well.

We have for several years been treating cases of sprue with pancreatin in addition to the other recognized hygienic and dietetic measures, and believe it has been a real addition to the therapy of this disease. We do not believe with Starling that a hormone can always explain pancreatic secretion, and we believe that in the absence of hydrochloric acid, some other mechanism, probably nervous, is able to call forth pancreatic activity.

THE STUDY OF THE BILE

A great deal of work has been done within the last few years in the study of the duodenal contents and the bile obtained therefrom by various methods in the hope of aiding us in the diagnosis of various biliary diseases, and, as correlative of this method, the introduction of the so-called medical drainage of the gall-bladder. In regard to the first, that is, the diagnosis of gall-bladder disease, we have been singularly disappointed in the results obtained. As regards

bacterial findings, it is an undeniable fact that in the duodenum, especially in the subacid or achylic condition of the stomach so often associated with gall-bladder disease, there is a great wealth of bacteria, including colon bacilli, streptococci, etc. The assumption that such bacteria represent biliary disease is, we feel, a very unwarranted one. In certain instances, possibly as the finding of a small calculus, or the appearance of some rare intestinal parasite such as lamblia, after the gall-bladder has been medically drained, it may be a help, but as a routine measure, we feel it is not safe to depend upon. The interpretation of finer variations in the fluid, such as the appearance of mucus, various cells, etc., as a sign of gall-bladder disease, we think is not sound, as there are so many inevitable errors in the technic, while as a negative side of the picture, the absence of striking evidence of pathology may be met with in those very cases where the gall-bladder is most seriously diseased, may lure the clinician into a false sense of security, and inevitable surgical treatment may be postponed. Recent work also has very seriously criticized the interpretation of the various types of bile, and has especially assailed the view that the so-called B bile represents necessarily bile from the gall-bladder.

As regards treatment, we have fundamentally always been opposed to the introduction of foreign bodies into any portion of the anatomy where the mechanism is so arranged that it is obvious that solid substances were not intended to be there. In the second place, we cannot conceive of any seriously diseased condition of the gall-bladder, notably chronic infection, where infection is deep in the mucosa or even in the muscular coats, being materially benefited by such measures. We can conceive of conditions where they may do real harm; while in the milder cases, such as catarrhal jaundice, it seems to us that an amplification of the ordinary method of stimulating the gall-bladder to empty its bile and to increase the amount of biliary secretion (the former, however, much the more important) is a far saner procedure. Experiments by many have shown that many other substances besides magnesium sulphate will stimulate the emptying of the gall-bladder—for, after all, this is a normal mechanism, and is brought about every time food enters the duodenum. In practice this can easily be brought about by the giving of small meals at frequent intervals, by the giving of simple fluids,

of water, dilute acids or solutions of various salts, generally in orthotonic solution, and probably by the administration of various other substances such as beef juice, bouillon, thin soups, etc.

In regard to the clearing up of deep infection by the so-called medical drainage think, for instance, of the difficulty of treating a case of chronic pyelitis where, in addition to direct flushing out of the pelvis of the kidney by almost unlimited amounts of fluid given by mouth, by rectum or subcutaneously, we also have a chance of directly irrigating the pelvis of the kidney with antiseptic solutions, and think in how relatively few of these cases a real cure takes place. Consider, then, the anatomy and physiology of the gall-bladder, and realize how really absurd it is to expect disinfection by the only methods possible. After all, a realization of the function of the liver, as well as the diluting effect of the secretion of the bile ducts, the concentrating effect of the gall-bladder, of the normal stimulus to liver activity and to bile excretion can furnish us with measures quite as plausible and far safer in regard to therapy, while as regards diagnosis, in our experience nothing in this field has as yet supplanted a thorough analysis of the case, careful consideration of all etiological factors, and a thorough clinical examination including a careful analysis of gastric contents and thorough stool studies.

INTESTINAL BACTERIOLOGY AND ITS RÔLE IN DISEASES

Bacterial Therapy.—We have always felt that some of the most fascinating problems to be solved in digestive pathology are those connected with intestinal bacteriology, the normal bacteria of the intestinal tract, their variation, at different ages and under different conditions of life, notably dietetic conditions and the possible rôle they may play in disease, either by the increase of species normally present, by the introduction of new species, or by the effect of decomposition and putrefaction of foodstuffs brought about by their growth in the intestinal tract, notably, of course, the decomposition of protein foods. We realize, of course, that under normal conditions the mouth harbors an enormous number of bacteria, including many streptococci, and that pathological conditions, chronic tonsillitis, pyorrhœa, etc., furnish peculiarly satisfactory conditions for increased bacterial development and the presence of more pathogenic forms; that under

normal conditions the œsophagus and, practically speaking, the stomach are free of bacteria and that the same applies to the duodenum, although just as soon as the stomach shows abnormality in the secretions, notably if its acid content becomes low or absent, there is a very large finding of bacteria in stomach and duodenum, many from the food or from the mouth, some ascending from the intestine. In the small intestine the bacteria gradually increase, as one goes toward the ileo-cæcal valve, with streptococci predominating, and gradually increase in the ascending colon, bacillus coli predominating, but from that point down there is a steady diminution in the number of living bacteria to the rectum. We realize that the bacterial flora changes remarkably with age, is quite different with the milk diet of children from the mixed diet of adults, and even in the case of children varies as to whether they are breast-fed or bottle-fed; that it varies with the diet at any age, and that we can very materially change the flora by variations in the diet.

The study of the rectal stool for bacteria is, of course, extremely disappointing. We have recently been making studies of both aërobic and anaërobic organisms at various levels in the intestinal tract, obtaining the cultures at operation, notably appendectomies and large resections, and we have been able to isolate certain anaërobes and to definitely incriminate them in certain disease processes in a few instances. Certainly these Gram-positive proteolytic anaërobes, either normal inhabitants of the tract or new species, have great possibilities in developing various toxins, if only they are given the proper cultural conditions, such as marked stasis, pathological conditions of the intestinal wall, and proper diet. Eppinger and Guttman isolated years ago two very toxic nitrogenous split products, one histamine, the other related to putrescine, from the stool in patients suffering with disease, and they were able to reproduce the symptoms by the use of these substances isolated; while in recent years a great deal of work has been done on the rôle which histamine plays, not only in so-called autotoxæmia, but in shock as well. Whether in the development of histamine, formic acid is necessary, and whether to obtain this formic acid certain sugar-splitting bacteria have to be present, is an interesting question, but one which has not yet been absolutely solved. It possibly explains the great benefit obtained

in certain cases by the elimination of sugars from the dietary, just as benefit in certain other cases can be ascribed to the elimination of animal protein from the dietary and the consequent inability of certain of the proteolytic anaërobes to have a proper medium on which to grow and develop their toxic split products. Recently a great deal of interest has been attracted to the changing of the bacterial flora in the hope that the more dangerous bacteria may be overgrown, or their effects neutralized. This, of course, was more or less inaugurated by Metchnikoff with his Bulgarian lactic acid bacillus; but when it was found that this could not be transplanted in the intestine, although unquestionably it benefited certain cases, attempts were made to utilize other bacteria. Probably the most promising work has been that of Rettger, Gompertz and others to transplant the bacillus acidophilus, although our experience with this has not been sufficiently long to make us come to a conclusion. The growth of this organism is unquestionably tremendously helped by large amounts of lactose in the diet; in fact, if sufficient lactose is given there will be an automatic increase of this bacterium, even if it is not administered by mouth. The other method has been to attempt to transplant healthy colon bacilli by the rectal route, but with this method we have had no experience, nor have we, so far, used any vaccine therapy, with autogenous vaccines from what seemed to be the offending microörganisms. Nevertheless, taking it by and large, we feel there is no more promising field for the future than the study of the intestinal flora, their variations in health and in disease, their modifications by diet, the change in the flora by transplantation and perhaps what is the most important, but what is obviously the most complicated part of the problem, the careful study of the chemistry of the products obtained under these conditions in the intestines and the rôle they play in that much-discussed, frequently described condition, autotoxæmia, a condition, however, in which the diagnosis in the vast majority of cases is based on insufficient data, or no data at all, and which often is but a cloak to cover our ignorance of the real underlying process of disease. Practically speaking, we have made very little use of intestinal irrigation. It may be of benefit, but we have felt distinctly it was a two-edged sword and unquestionably seriously impaired the motor

mechanism of the large bowel if used too long; and we have largely used dietetic and physical measures, the former in the hope of affecting the flora and improving nutrition, the latter—massage, exercise, etc.—to improve general nutrition as well as intestinal tone.

SOME OBSERVATIONS ON DIET, NOTABLY AS REGARDS HEADACHE AND
HEPATIC INSUFFICIENCY. THE VITAMINS

Closely connected with the preceding subdivision of our subject, we have been very much interested in the rôle of diet in disease; but here we will not talk about the more obvious dietetic principles involved as in the overfeeding treatment of the neuroses, the sparing treatment of gastric ulcer, the principles of lessening fluid intake at meal hours in atony and ptosis, the non-irritating dietary in ulcerative conditions, the stimulating dietary in atonic constipation, the low-salt dietary in hyperacidity, the protein-rich fat-rich dietary in pellagra, the milk or meat or fruit dietary in sprue, etc., but will call especial attention to the rôle of sugar and the starches and of animal protein in certain conditions in which there is a digestive element, notably in migraine and in bilious headaches. From our studies in this field we believe that there is a very large group of headaches in which, whatever the primary cause, the character of the food plays a very potent rôle as an explosive factor in bringing about an attack. In fact, in every case of headache, even admitting some underlying cause, there always remains the problem to be solved—what is the spark that produces the attack? In certain of these cases we believe it is some factor associated with the character of the food intake. The two main groups in our series have been first those associated with excessive intake of carbohydrate; that is, excessive as far as individual ability of the organism is concerned, often not at all excessive as regards the average individual, obviously suggesting some congenital or acquired defect in carbohydrate metabolism; and second, those in which animal protein food plays the major rôle. In our experience, the former is the larger group, and we have been singularly gratified by the considerable number of cases ameliorated or absolutely cured by insistence upon sugar-free, starch-free diet for a considerable period of time, the weight being held, or almost held, by a liberal addition of fat to the dietary at first, and later

by the cautious addition of very small amounts of starchy food. In this group it is probable the liver plays some rôle, as in many of our cases a temporary hyperæmia of this organ was noted at the time of the headache. What is the exact underlying factor, it is rather hard to definitely determine. Hare, of England, believes it is due to an accumulation in the blood of carbonaceous material, calling it hyperpyrexia, and he believes other periodic disorders, notably asthma, may be due to a similar cause, while recently certain investigators have suggested that by the elimination of sugars we eliminate a very potent factor in the development of certain bacteria whose main function is to form formic acid from these sugars, and that without formic acid, histamine, which they regard as the fundamental cause of the attacks, cannot be formed from histidine.

There is another group of cases in which the headaches seem very definitely related to the intake of animal protein food, and in many of these cases the patients themselves have noted that all forms of animal protein, or special forms such as eggs, or milk, or, as in one of my cases, ham, may be followed by severe headache. Skin reactions in my experience have been of no value in determining the nature of the special protein involved, but a small proportion of these cases have been helped by the hemoclastic test of Widal. As regards the diagnosis, this is based on the conception that the liver has a proteopexic function, the deficiency of which is shown clinically by the headache or other clinical manifestation, and is recognized by the marked diminution of leucocyte count and systolic blood-pressure after ingestion of protein food, while we have also utilized his suggestion of bringing about a temporary desensitization to animal proteins *in toto* by administering peptone one hour before the intake of food. Be that as it may and whatever the underlying cause, I am quite convinced that certain cases of headache are often caused, or at least provoked, by improper food, that sugars and starches play the major rôle in one group, animal protein in another, and that by recognition of this fact and a proper regulation of diet, many of these cases may be materially helped and clinically, at least, cured.

The modern conception of vitamins has, of course, been utilized in gastro-intestinal pathology, and McGarrison goes so far as to suggest that a very considerable number of the vague digestive

diseases, notably those met with in the tropics where the food supply is often very limited along certain lines, are probably expressions of some form of deficiency disease due to the lack of certain vitamins. There is probably a germ of truth in this, and there is no question about it that certain nutritional diseases are somewhat akin to rickets or to scurvy, and distinctly represent the lack of certain fundamentals in the diet. The conception of vitamins is another reason for insistence upon overfeeding therapy with a broad mixed dietary in all cases of deficient nutrition, and it is a suggestion that there is real danger of the development of certain symptoms due to the lack of special vitamins in some very restricted dietaries such as a meat-free animal-fat-low dietary so often used in certain cases, and in the dietaries in which fruits and vegetables have been entirely eliminated, and it is the probable explanation why certain foods rich in vitamins, so popular at the present time, unquestionably have a beneficial effect in certain cases.

It is a fascinating field, and the work of Mellanby, Chick and Hume on the nutritional diseases among the starving children in Vienna is extremely suggestive in showing the possible rôle played by vitamins, not only in the recognized deficiency diseases such as scurvy, certain forms of ophthalmia, and probably rickets, but also in many vague nutritional diseases which do not fall under any definite clinical heading.

BLOOD CHEMISTRY IN DIGESTIVE PATHOLOGY

At the present writing, although a great deal of work has been done on the subject, blood chemistry has not added very largely to our knowledge of digestive diseases. The increase of cholesterin in the blood, described by many in gall-bladder lesions, has been vigorously opposed by just as many who have not found this increase in gall-stone or have found an equal increase in other diseases; while the increase of sugar in the blood as described by Grove in carcinoma, while extremely interesting, has not been verified by a number of other observers, and its significance must still be regarded as *sub judice*. Of course, we know there is an increase in practically all the blood constituents in cases associated with marked malnutrition, notably in the latter stages of carcinoma of various portions of the

digestive tract, as an expression of starvation and dessication of tissue, but certainly at the present writing there are no specific metabolic changes in gastro-intestinal diseases that cannot be explained upon the associated disturbances of nutrition, absorption and elimination, with the possible exception of those changes met with in cachexia in carcinoma, and in tetany in pyloric obstruction. I feel that at the present writing far too much reliance is laid upon blood chemistry, and I am continually meeting cases very poorly studied clinically, without a carefully analyzed history, without a thoroughly made general physical examination, and yet where days and often weeks have been spent upon the most complex chemical and metabolic studies, and conclusions deduced therefrom which were not justifiable in our present knowledge of this subject, and which could have been absolutely controverted by a careful clinical study of the case.

PROTEIN SENSITIZATION

There has been quite a cult which has attempted to preach the doctrine that it is quite possible to determine what foods are suitable and what foods are not suitable in a dietary, that is, as far as protein foods are concerned, by skin tests with the various proteins to determine the presence or absence of increased sensitiveness towards them, but in our experience this has been a very elusive method. In many cases violent reactions are obtained with proteins that we know are well borne; in other cases no reaction by proteins that clinically always are productive of symptoms, and our experience coincides with that of Blackfan in a large group of children. The only cases in which such tests are really of very great value are those in which the picture is associated with skin manifestations—erythema, urticaria, eczema. In these cases we have been tremendously helped by the skin test in determining which protein or proteins are the probable causes of the trouble, a matter relatively easily tested if they are playing the fundamental rôle by the rapid amelioration of the skin lesions if the offending protein or proteins are eliminated from the dietary, and in these cases it is quite possible to desensitize the patients by giving the offending proteins by mouth, first in minimal, then in gradually increasing doses, until a relatively high grade of tolerance has been established. We have found this method

far more satisfactory and unquestionably more practical than attempting desensitization by hypodermic administration.

THE RATIONAL ATTITUDE TOWARDS X-RAY DIAGNOSIS

We have felt very strongly that the introduction of the X-ray has been distinctly a two-edged sword in the digestive field. In the case of a great many physicians it has consciously or unconsciously persuaded them to be much less thorough in their careful analysis of the case and in their clinical studies, and this, we feel, is very deplorable, because from X-ray studies alone diagnosis should not, and in most cases cannot, be made. It is to us peculiarly distressing to see a diagnosis founded on very careful clinical study of the case overthrown by a few words from a radiologist, who often is untrained clinically and only too frequently has not had a broad experience in reading X-ray plates. While it is obviously easy to fluoroscope a patient and to take X-ray plates, nothing is more difficult than to interpret the pictures on the screen, or to interpret the abnormalities of form or position as manifested in the plates. I was talking not long ago to a physician who is probably the ablest internist in Italy, who made what seemed to me a very significant remark, which was, "I would rather have no X-ray examination in a case than X-ray plates interpreted by anyone other than a master in this field." To regard the X-ray as the court of last resort in diagnosis is fundamentally wrong except in gross conditions which can, in the majority of cases, be diagnosed just as definitely by other means. Except in such cases the X-ray diagnosis can rarely be definite—should only suggest various possibilities, the probability of which must be dependent upon other features of the case, as determined by careful history taking, a thorough clinical examination, and the use of various special tests. The X-ray is but one of many means of reaching a diagnosis, none of which except in occasional instances is capable of furnishing the diagnosis *per se*, but each of which should be used in proper proportion in reaching a probable diagnosis or an absolute diagnosis. To show the difficulty even in the hands of experts, I would suggest the advisability of having the same case studied under exactly the same conditions by various radiologists. In certain cases all will agree on the diagnosis. These, as a rule, are the easy cases, diagnosable by other means; but in a considerable proportion of cases very

different diagnoses will be furnished by different men, all honest, all experienced, all capable in this field. The pictures are definite, the images on the screen are definite, but the interpretation always is a question of subjectivity, and must differ unless the picture is perfectly obvious.

THE IMPORTANCE OF SPECIAL TESTS

It is hardly necessary to call attention here to the importance of certain special tests and methods, and yet no gastro-intestinal examination is complete without them. In every case in which there is any suspicion of pelvic or intestinal trouble a rectal and, if possible, a sigmoidoscopic examination should be made. The œsophagoscope should be used in every case in which there are œsophageal symptoms, because it will give us data that cannot be determined by the fluoroscope or by the clinical history of the case. Every case should have very careful stool studies made both as regards the digestion of food stuffs, the presence of pathological substances, ova, parasites, etc., the presence or absence of occult blood, and it is wise to make careful macroscopic as well as microscopic and chemical examinations in every case. We have found great help from routine Wassermann examinations in all cases where diagnosis is uncertain. This has been notably helpful to us in cases of digestive neuroses without obvious cause and in cases of suspected carcinoma to rule out gumma; while it is needless to say that routine examination of urine and blood are essential as part of the general examination of every case. Nothing is more interesting to us in our clinic than the number of cases that come with nothing but digestive symptoms, in which the entire trouble or the main trouble is elsewhere, and this is the reason we have always preached the doctrine that every case should have a complete general history and be given an absolutely thorough physical examination, before assuming that the case is digestive, or before making the intensive digestive studies which are essential if the case really represents digestive pathology. In one case an Argyll-Robinson pupil may suggest that the pain simulating gastric ulcer may be in reality the gastric crises of tabes; in another case a pulmonary lesion may suggest that the gastric symptoms may be due to this cause, and may represent what may be called a vagal irradiation or perhaps a symptom of early toxæmia; in another case the first

symptom of a decompensating myocardium may be very slight digestive disturbance; in another the finding of albumin and casts, a low specific gravity and a lowered phthalein output may show that the basis of the digestive symptoms is a small contracted kidney; eosinophilia in the blood may suggest that the gastro-intestinal picture sometimes suggesting carcinosis, sometimes enterocolitis, may be due to uncinariasis; and sometimes an increased pulse rate and tremor of the hands verified by an increased metabolic rate may give the cause of the intractable diarrhœa or persistent vomiting—as Graves' disease, often the earliest symptoms just as intractable constipation may be the only symptom of hypothyroidism; in another case retroflexion of the uterus or its enlargement due to pregnancy may explain the gastric symptoms presented—persistent nausea and vomiting, for instance. So we may amplify the examples *ad infinitum* which makes one feel as nothing else can how intimately connected in its symptomatology the digestive system is with every other system in the body and which should make us realize that the only safe gastro-enterologist is the one that approaches his problem not from the viewpoint of the specialist but from the viewpoint of the broad internist with special interest and a special training in this line, but with a retention of all his skill in general clinical method.

THE RÔLE OF SURGERY IN DIGESTIVE DISEASES

Only a few years ago, influenced by the brilliance of surgery in acute abdominal conditions, by the safety of surgical technic, and by the improvement in anæsthesia, there was a feeling that, barring the purely functional disorders, surgery was the treatment of election in the vast majority of chronic gastro-intestinal diseases, but the years have shown that this is a dangerous and unfounded viewpoint; the effect of rest, hospital environment, and good post-operative after-care deluded the surgeon into the belief that the apparent great benefit met with in practically all cases after surgical procedure represented permanent cure; but first the physicians to whom the patients too often returned with a renewal of some or all of their old complaints, or with new complaints, later many surgeons, and last of all the public at large, realize that in a considerable percentage of cases absolute cure did not take place after surgical procedure, and there

has thus gradually grown up a healthy reaction against the ultra-surgical viewpoint. No one realizes more than I the absolute necessity of surgery in practically all cases of the acute abdomen; no one is more willing to utilize surgical help in the chronic cases after medical, dietetic, mechanical, hygienic and physical methods of treatment have been given a long and fair trial without success; but no one is more opposed to the view that in all cases of ulcer, adhesions, chronic appendicitis or chronic gall-bladder disease, surgery is the immediate weapon to be chosen. In all such cases where immediate surgery is not required, I have felt that non-surgical means should be tried first conscientiously and skillfully, trying to explain to the patient the *raison d'être* of each procedure so that his coöperation may be obtained. This would not be justifiable if surgery were able to promise complete cure in the vast majority of these cases, but I know of no field of surgery where complete or almost complete success is less frequently met with than in that of chronic conditions in the upper right quadrant, chronic appendicitis and abdominal adhesions, except it be the attempt on the part of the surgeon to correct displacement of stomach or intestine. Think of the failures each of you has met with after many of these operations; the vicious circle, the jejunal ulcer or the intestinal dyspepsias after gastro-enterostomies; the return of many of the symptoms after gall-bladder operations and after the removal of a chronically diseased appendix, and the many symptoms referable to post-operative adhesions. On the other hand, if surgery is decided upon, I wish to make a special plea for a far closer coöperation between surgeon and internist before and at the time of operation to decide what is the best procedure; during the post-operative period and the period of convalescence to try by the installation of proper early and late after-care, especially as regards diet, rest, massage and other physical therapy, to reduce failures to a minimum, for I am quite convinced that many potential successes after the surgical treatment of various abdominal conditions are converted into partial or complete failures by a lack of appreciation on the part of the surgeon of the real need for such coöperation and by his deeply seated conviction that functional disturbances associated with organic lesions disappear immediately after operative removal of the diseased organ or tissue.

A FEW OTHER CONSIDERATIONS

Certain other observations have been of especial interest to us in this field, but here we shall barely have time to mention a few of these, such as:

(1) The importance of regarding every case of digestive disorder in middle or later life coming on suddenly, without cause, and not yielding rapidly to rest, diet, and symptomatic therapy, as potentially malignant, and as justifiably treated by exploratory incision even before definite diagnosis can be made.

(2) The importance of recognizing the diminishing acid readings, the persistent occult blood in the stool on a non-irritating diet as suggestive of an ulcer beginning to show malignant degeneration.

(3) The usual absence of pain in gastric cancer; its usual presence in gastric ulcer.

(4) The frequent disturbances of heart action in unrecognized gall-bladder disease, often almost the only symptom, and often marvelously relieved by proper treatment of the gall-bladder.

(5) The frequency with which unrecognized gall-bladder conditions are the cause of the vague dyspeptic disturbances, usually associated with achylia, so common in women in middle life, especially those who have borne children.

(6) The difficulty in unraveling the relative rôles played by organic lesions and their associated functional disturbance in the symptom-complex presented, the latter being tremendously influenced by the stability or instability of the patient's nervous system, and sometimes so out of proportion to the associated organic lesion that that may be entirely neglected in the diagnosis.

(7) The importance of realizing the rôle played by the psychic and nervous influences, notably as observed in the purely functional, but also in the organic digestive diseases, especially gastric ulcer, and the necessity of reducing such factors to a minimum in many cases if a cure is to be expected or recurrence of the symptoms to be prevented.

CONCLUSIONS

In this survey of the field of digestive diseases we have tried to bring out certain main points based upon our experience.

First, that it is impossible to build up a gastric pathology on

secretory lines; that fractional methods, as far as clinical work is concerned, hardly justify the time spent upon them; that no one should neglect investigating the fasting stomach in gastric diagnosis, and that while secretory readings should not be neglected, and certain of the readings, rough though they be, are of very great value, in the majority of cases, however, the secretory findings play a relatively small rôle in reaching our diagnosis.

Second, the apparent disappearance of pancreatic ferment in most cases of carcinoma of the head of the pancreas and in advanced cases of sprue, is of value in the diagnosis of both these diseases, while the use of pancreatin is unquestionably helpful in the treatment of sprue.

Third, in our experience the medical drainage of the gall-bladder in diagnosis and treatment has proven distinctly disappointing. In diagnosis there seems to be too many unavoidable errors to make the method of general value; in therapy the procedure is open to much criticism, and simpler methods without the introduction of a foreign body into the duodenum will probably give as good and probably better results in most cases.

Fourth, there is a very promising field of research in intestinal bacteriology, especially that of the anaërobcs, their relation to proteolysis and to autotoxæmia, while therapeutically change of flora by implantation or by change in diet seems to have considerable possibilities.

Fifth, it is essential that physicians pay more attention to diet, not only the special types of diet in various diseases such as the dry diet in gastric atony, the meat-free diet in ulcer or hepatic insufficiency, the sugar-free, starch-low diet in certain headaches possibly of toxic origin, the diet rich in vitamins in cases where deficiency may play a rôle, and the salt-free diet in hyperchlorhydria, but to those cases where there seems to be a real protein hypersensitiveness on the part of the patient either to some special form or forms of protein or to animal protein as a whole. In our experience in the *former* group the skin tests have only been of value in those cases where the disease is associated with skin manifestations; in a few cases of the *latter* the hemoclastic test showing a lowered proteopexic function of the liver has been of help. In both cases attempts should be made at desensitization.

Sixth, the X-rays are used far too indiscriminately and extensively in digestive diagnosis. They are not necessary in every case. Their value depends entirely upon the skill of the fluoroscopist or radiologist in reading his pictures—the really expert analysts of these pictures are none too plentiful—and finally, to regard the X-ray as a court of last resort is fundamentally an extremely unsound point of view.

Seventh, just as no gastro-intestinal examination is complete without a thorough, painstaking history and a complete general physical examination, so none is complete without certain special tests, among the most important of which should be mentioned rectal examination, sigmoidoscopic study, a thorough study of the stool, bacteriological, chemical, macroscopic and microscopic. Certainly, my feeling is that the field for further study in digestive pathology is not the stomach but the intestine with its extreme complexity of function, a study which will require the highest grade of training along bacteriological, chemical, biochemical and physical as well as clinical lines, but which will unquestionably be productive of great rewards in the future, and will open up what is now (except in the case of gross lesions) almost an unexplored country.

Eighth, in our experience in gastric ulcer, the history of the case, especially as regards periodicity, is probably the most important item in reaching a diagnosis, while in treatment each case should be individualized and especial attention should be paid to the underlying or associated psychic factors; in gastric cancer we wish to again reiterate that to expect cure in these cases we must advise operative treatment on really insufficient data, always being suspicious of cases of digestive disturbance in middle life without cause after careful examination and not yielding to symptomatic treatment.

Ninth, in digestive therapy in our experience hydrochloric acid is a very disappointing drug in most cases of subacidity and achylia, except in the gastrogenous diarrhœas where it is often brilliantly successful. As regards belladonna, there is unquestionably a group, probably not very large, of gastric and duodenal ulcer, mucous colitis, spastic constipation, etc., where the cause seems to be a lack of balance between vagus and sympathetic—a true vagotonic state—and where brilliant results are obtained by the use of this drug in *maximal* amount.

Tenth, it seems wise to sound a note of warning against the indiscriminate use of surgery in chronic digestive diseases, and to try to instill into the patient the importance of trying other means first, but if surgery is decided upon, a considerable proportion of the success will be dependent upon the close coöperation of physician and surgeon during and after the operation.

Eleventh, may I suggest that the almost universal belief that *post hoc* is of necessity *propter hoc*, and our passion for objective modes of treatment have led far too many to ascribe cures to such methods, when, in reality, it was not because but in spite of such methods that the patient improved, and the true curative agents were those greatest of all therapeutic measures—time and rest and faith.

From these considerations it must appear that we are far from having reached the stage when special methods or special tests can give us our diagnosis in the digestive sphere, or where it is safe to neglect the fundamental methods of diagnosis in preference for the special methods. I feel that in a sense we are in a peculiarly dangerous age in medicine; ultra-specialization and the development of newer methods in diagnosis and treatment have tended to lessen our interest, our training and our skill in the fundamentals of diagnosis without, as yet, furnishing us equivalents from the newer developments. Medicine is not as yet, and is far from being, a subdivision of chemistry. Diagnosis is not, and I trust never will be, an expression of applied mechanics. It is far too early to think of neglecting in one iota the methods of reaching a diagnosis which have been tested out by many years of careful trial and deep thought on the part of the masters in our art and in our science. Development is not necessarily the expression of amplification, multiplication and complication of method. Progress is not measured by the number of new methods but by the addition of methods which are sound and which are helpful; for our passion for the short cut by objective procedures in diagnosis and treatment is often spectacular but is not often sound. Diagnosis, except in rare instances, can never rest upon one method or upon one test. It represents a complex process in which, in the ultimate analysis, judgment and thought and experience in subjective and objective reactions play the paramount rôle. Certainly, the real opprobrium in which gastro-enterology is held by many of the best general practitioners and soundest internists is due

to the feeling on their part that much of the work in this field is not sound, that many of the methods used are open to much and just criticism, and that they are singularly open to exploitation. It is fascinating to chase rainbows, but at the end of the very few is to be found the pot of gold—scientific, not material, gold. Yet we must encourage special work in our field along many of the lines open for research in the hope that some will lead to real contributions, but before encouraging such work we must be sure that the fundamentals underlying it are firmly based. To my mind at this writing the only safe gastro-enterologist is he who, in the first place, is an internist and clinician in the broadest sense of that word, and on this foundation studies intensively the problems in this special field by the use of its special methods.

No sermon so long and so discursive as this should be without its moral, and so in concluding may I try to draw one from the paper I have presented? I have tried to show how dangerous it is to consider gastro-enterology as a narrow specialty; how unsafe it is except in the hands of well-trained general clinicians; how much it has been harmed in its development and in the appreciation in which it is held by the great mass of physicians by the use, and sometimes, unfortunately, by the abuse of certain methods based upon unsound or unsafe foundations. There is no royal road to diagnosis in this field, and diagnosis can never be easy as long as our body is subject to the protean pathological changes of disease, nor so long as these are associated with ever-varying functional responses. The exploration of this field is only safe in the hands of those who utilize all of the general methods of diagnosis which represent medical progress, and combine with them only those special methods which are physiologically sound and clinically helpful. In the hands of those who approach its problems in this spirit it is a very fascinating field with ever-widening vistas and possibilities, with ever-increasing exactness in diagnosis, with ever-increasing soundness in therapy; while it has almost unlimited potentialities in the field of research if one approaches this in the only safe way—that is, where the clinic and the laboratory in close coöperation will combine and utilize all their resources in opening up new and ever more interesting fields of thought and progress.

CORRECTIVE TREATMENT OF THE COMMONER FORMS OF ENTEROCOLITIS*

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CHRONIC enterocolitis is an inflammation of the small and large intestines, with or without ulceration, which persists for more than a month or two after the acute stage has subsided. The intensity of the process may range from the mildest type of intestinal indigestion up to ulceration or perforation.

GENERAL CONSIDERATIONS

Text-books on the subject enumerate many etiological factors; however, most of those described are of little practical value for preventing or treating this condition. The incidence of chronic enterocolitis is widespread, and it is directly or indirectly responsible for many kinds of functional disturbances and organic damage. The symptomatology will not be discussed in detail because it is familiar to you. The discussion will be limited to the etiology and treatment of this common disorder.

Since enterocolitis at one time or another attacks the average human being, it is logical to believe that there is a common primary cause. When we speak of etiology, it is not to define the micro-organisms responsible for the enterocolitic pathology, but more properly a consideration of the many factors and agencies that make possible and allow of the bacterial invasion of the intestinal tract to produce the local pathology and the constitutional manifestations which are so often found to be associated with this affection.

Perhaps the most revolutionary conception of medicine is that serious diseases or functional disorders may be caused by a deficiency or lack of certain constituents in food. The inquiries as to why

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focal infection occurs have developed some very interesting facts related both to diet and health and to diet and disease. This discussion of enterocolitis would be narrow if it did not include focal infections throughout the extent of the digestive tract. It is a frequent observation that enterocolitis is associated with existing or pre-existing infections of the upper digestive and respiratory tracts. Therefore, to cover the subject properly it is necessary to include a number of recent facts that have been established by experimental and clinical observations on the relation between faulty food and digestive tract infections. The subject matter of this paper is based on the observations of McCarrison,^{1, 2, 3} McCollum,^{4, 5, 6, 7} McClendon,⁸ Shipley,⁹ Howe,¹⁰ Grieves,¹¹ Hess,¹² Mendel and Osborne,¹³ Hopkins,¹⁴ and many others on the relation of diet to certain types of deficiency diseases and digestive tract disorders and diseases. Their observations have shown the necessity for balancing the important ingredients of food essential to the body's well-being, as suitable proteins, carbohydrates, fats, minerals and vitamins. The studies of Herter,¹⁵ Kendall,^{16, 17, 18} Rettger,^{19, 20, 21, 22} Cannon,²³ Bass,²⁴ Kopeloff and Cheney,²⁵ Eggston and myself,²⁶⁻³⁴ on the relation between diet and the intestinal flora and that existing between a normal intestinal flora and the state of health add another factor to the causation, the prevention and the treatment of digestive tract disease.

FAULTY FOOD

We no longer eat many of our foods in their natural state. The preparation of food for preservation, storage and transportation alters its food value in many instances. Grains have been robbed of a great part of their mineral and vitamin content. The sterilization or evaporation of milk has decreased its mineral content. We discard the cartilaginous and tendinous portion of fleshy food and would not think of eating the blood of animals or gnawing on bones. The peelings of many fruits and tubers are discarded and much of the mineral value of these foods is thus lost. We insist on pure white sugar when unrefined or brown sugar would be nearer our needs. Table salt has been deprived of iodine, calcium and other chemicals which are such an essential part of diet. These are but few of

the examples necessarily enforced by the complexity of our present-day civilization.

This injury to food does not stop in its preservation, preparation and storage. Vegetables may be lacking in those necessary proximate principles and vitamins because of being grown upon soil unsuited for their proper nutrition, or if deprived of sunlight. Milk may be lacking in these principles if the cow has been fed upon provender grown upon unsuitable soil. The same is true of meat derived from animals fed upon faulty provender. Therefore, there are many agencies that contribute to the production of faulty food, although the physical characteristics of the food may not appear to be altered. Recently, the commercial interests have aroused a widespread interest in vitamins and have insidiously suggested that a lack of vitamins is the chief cause of deficiency diseases and nutritional disorders. Investigators have conclusively shown that there are other principles as important as the vitamins and that their absence negatives the value of the vitamins just as much as the absence of the vitamins negatives the food value of the other factors. Paradoxical as it may sound, it is the very element of the population which could afford a good food balance among which a devitalized diet is observed most frequently. The poorer classes eating coarser bread and utilizing all the vegetable parings, fats and certain protein substances usually discarded, subsist on a diet much richer in vitamins and minerals.

FAULTY FOOD AND DIGESTIVE TRACT INFECTION

McClendon, Shipley, Howe and Grieves have recently contributed some very instructive data on the relation existing between diet and dental caries. They have somewhat upset many accepted theories in reference to dental infection and in the light of their investigations it would appear that dental diseases are not essentially a local condition, but rather a manifestation of constitutional disturbances produced by the prolonged use of faulty food. Their studies of the nutrition of teeth have shown that they require all the food elements needed by the body and, in addition, their texture is dependent upon necessary chemical elements, as calcium, fluorine and the phosphate ion. They have shown that there is a relation

between diet and the metabolism of bone and teeth and that the metabolism of bone and teeth is similar. To sum up their conclusions, the proper development and the maintenance of the proper nutrition of bones and teeth are dependent upon an adequate provision of calcium, phosphate and vitamins A, B and C.

McCarrison, whose opportunities for the observation of the effect of diet on man and animals have been very unique, and whose observations have extended over a long period of years, has been able to produce definite endocrine disorders by vitamin deficiency in association with faulty food balance. He has shown the close relationship between a proper diet and the harmonious metabolic state. He has called attention to the necessity of providing food which will maintain and sustain the endocrine balance. The work of the other investigators mentioned has proved that goitre, rickets, scurvy, ophthalmia, beri-beri, pellagra and other diseases are due to a deficiency of some essential principle of nutrition. McCarrison has been able to produce gastro-enteric pathology in man and monkeys by feeding natural foods from which he had extracted one or more of the vitamins or to which he had added an excess of starch, or of fats and starch. By feeding this faulty food over variable periods of time he has been able to produce diarrhoea, dysentery, dyspepsia, and gastric dilatation, gastric and duodenal ulcer, intussusception, colitis and failure of colonic function. He does not believe that these conditions are invariably produced by faulty food or that faulty food is the only cause of them. He does contend, however, that faulty food is often at the bottom of their causation and if natural or well-balanced food were used from birth that their occurrence would be lessened materially. His conclusions regarding the experiments on monkeys manifesting gastro-intestinal conditions in consequence of the various deficient foods employed, are summed up as follows:

(1) The health of the gastro-intestinal tract is dependent on an adequate provision of vitamins. The absence of growth vitamins is capable of producing pathological changes in the tract which frequently assume the clinical form of colitis. This observation is of the highest importance in view of the frequency with which this malady is encountered at the present day. Deficiency of vitamin C is especially concerned in the production of congestive and hæmorrhagic lesions in the tract, and evidence of these may be found in animals which have not exhibited during life any of the clinical manifestations of scurvy in noteworthy degree. A state of ill-health of the gastro-intestinal tract may thus be a pre-

scorbutic manifestation of disease due to insufficiency of this vitamin, especially when associated with an excess of starch or fat, or both, in the food.

(2) The disorder of the gastro-intestinal tract consequent on vitamin deficiency is enhanced when the food is ill balanced.

(3) Pathologic processes resulting in this situation from deficient and ill-balanced foods are: (a) Congestive, necrotic and inflammatory changes in the mucous membrane sometimes involving the entire tract. (b) Degenerative changes in the neuro-muscular mechanism of the tract, tending to dilatation of the stomach, ballooning of areas of small and large bowels, and probably also to intussusception. (c) Degenerative changes in the secretory elements of the tract—of the gastric glands, the pyloric glands, the glands of Brunner, the glands of Lieberkuhn, and the mucous glands of the colon. These changes are such as must cause grave derangement of digestive and assimilative processes. (d) Toxic absorption from the diseased bowel, as evidenced by changes in the mesenteric glands. (e) Impairment of the protective resources of the gastro-intestinal mucosa against infecting agents, due to hæmorrhagic infiltration, to atrophy of the lymphoid cells and to imperfect production of gastro-intestinal juices. This impairment not only results in infections of the mucous membrane itself, but also permits of the passage into the blood-stream of microorganisms from the bowel. (f) It is to be emphasized that the pathologic changes found in the gastro-intestinal tract are more marked in some individuals than in others; and that, while all of them may occur in one and the same subject, it is usual to find considerable variation in the incidence of particular lesions in different individuals.

These observations are significant and when coupled with his observation that in uncivilized races, gastro-enteric conditions are very infrequent, are convincing proof of the relation of faulty food to enterocolitis. He was led to inquire why certain uncivilized tribes possessed such magnificent physique and preserved for so long the characteristics of youth, were so long-lived and unusually fertile and free from the functional nervous disturbances. During a period of nine years when his operating list averaged more than 400 major operations a year, he never saw a case of asthenic dyspepsia, of gastric or duodenal ulcer, of mucous colitis or of digestive tract cancer. He attributes the infrequency of these conditions to four circumstances:

(1) Infants are reared as nature intended them to be reared—at the breast. If this source of nourishment fails they die; and at least they are spared the future gastro-intestinal misery which so often has its origin in the first bottle.

(2) The people live on the unsophisticated foods of nature: Milk, eggs, grains, fruits and vegetables. I do not suppose that one in every thousand of them has ever seen a tinned salmon or a chocolate or patent infant food, nor that as much sugar is imported into their country in a year as is used in a moderate-sized hotel of this city in a single day.

(3) Their religion prohibits alcohol, and although they do not always lead, in this respect, a strictly religious life, nevertheless they are eminently a teetotal race.

(4) Their manner of life requires the vigorous exercise of their bodies.

The habits of these primitive people in respect to food are in striking contrast to those of our more highly civilized communities. These primitive people are content with natural foods in their natural state, that is, milk, eggs, grains, fruits and leafy vegetables, protective foods as McCollum has named them, "for they provide in proper quality and proportion the proximate principles and vitamins necessary for nutritional harmony and the proper vegetable residue for the healthy evacuation of the bowels." This information, so briefly reviewed, seems to establish experimentally and clinically that digestive diseases are due primarily, perhaps in almost every instance, to faulty food deficient in proximate principles or containing an excess of certain kinds of proximate principles or a deficiency of vitamins. This leads us to the next observation that I have promised to outline, based upon observations of the relation between diet and the intestinal flora on one hand, and the intestinal flora and disease on the other hand.

THE PROTECTIVE ACTION OF CERTAIN FORMS OF INTESTINAL BACTERIA

If the intestinal flora has a definite biological significance in relation to health and if the maintenance of this biological interrelationship depends upon the diet, then the study of these interrelationships must necessarily begin in early childhood, when the diet approximates more nearly the normal than at any other time of life and at which time the metabolic processes are perhaps harmonized best. If an infant is breast-fed the intestinal flora is found to be dominated by an aciduric organism, *B. bifidus*. Later when the child is weaned from the breast or is bottle-fed, the percentage of *B. bifidus* falls and there is a rise in the percentage of *B. acidophilus* perhaps a mutation form of *B. bifidus*, which is better suited to meet the conditions than *B. bifidus*. It is safe to assume that both organisms are aciduric forms normal to the intestinal tract of the infant and child, since they can be demonstrated

with such constancy in the stools of children. As the diet includes a higher percentage of starches and proteins, the flora becomes more complex, that is, *B. coli* makes its appearance in large numbers as well as such organisms as *B. aërogenes capsulatus*, Gram-positive coccil forms and putrefactive types. The increase of these forms naturally leads to a decrease of the aciduric types. Briefly, this is

FIG. 1.



The colon is at rest and free from peristalsis. (Schematic representation.)

the transformation occurring ordinarily in the intestinal flora of civilized man as he grows up. Experiments and clinical observations have led to the following conclusions which are summarized:

(1) The character of the intestinal flora as well as its metabolism are influenced directly by diet.

(2) Lactose, dextrin, fruit and vegetable residue promote the growth of the aciduric types and if consumed in sufficient quantities will cause the intestinal flora to be dominated by these types.

(3) The simplification of the intestinal flora is most successfully accomplished when other foci of infection in the teeth, tonsils, sinuses, respiratory tract, gall-bladder and the upper digestive tract are removed. In fact, there seems to be a co-existence of these infections.

(4) While a complex faecal flora may be present in an apparently

FIG. 2.



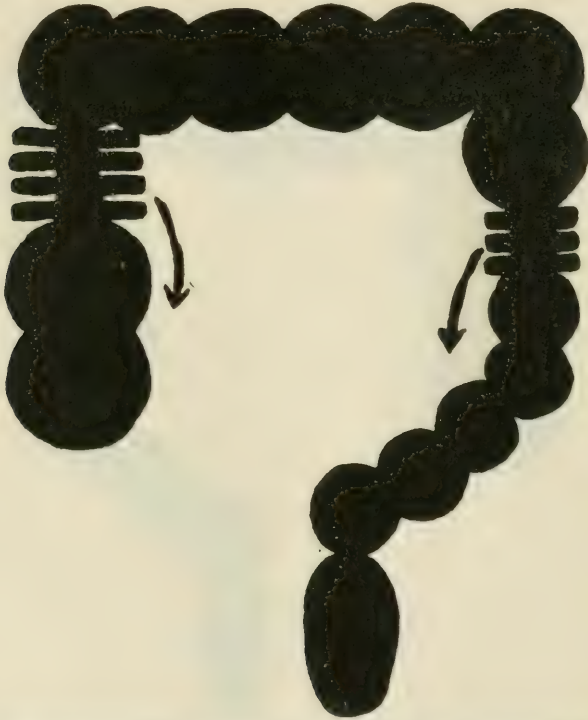
The peristaltic contraction has been initiated by the instillation of fluid into the rectal pouch. The stimulus originates in the rectum, and the peristaltic contraction begins in Cannon's ring. Arrows indicate that the peristaltic wave is splitting into two waves which travel in opposite directions. (Schematic representation.)

normal and healthy individual, it does not signify that this apparent state of health is predicated upon the complex nature of this flora, but rather that the health picture is not as sound as it appears and that the well-being of the individual is being menaced constantly by this type of flora. On the other hand, an aciduric or simple type of faecal flora is found normally only in healthy intestinal tracts

at a time when the organism is undergoing an actively constructive metabolic phase.

The researches concerning the intestinal flora are beginning to establish tangibly the value of this unique partnership between the human body and the protective microorganisms of the intestinal tract, and all the factors and influences which aid in maintaining a

FIG. 3.



The peristaltic waves have now split into two distinct waves and are travelling towards the terminal points, the rectum and cæcum. This is the peristaltic cycle operative during irrigation: A reverse wave from Cannon's ring to the cæcum and a propulsive wave from Cannon's ring to the rectum. Arrows indicate the direction of the peristaltic waves. (Schematic representation.)

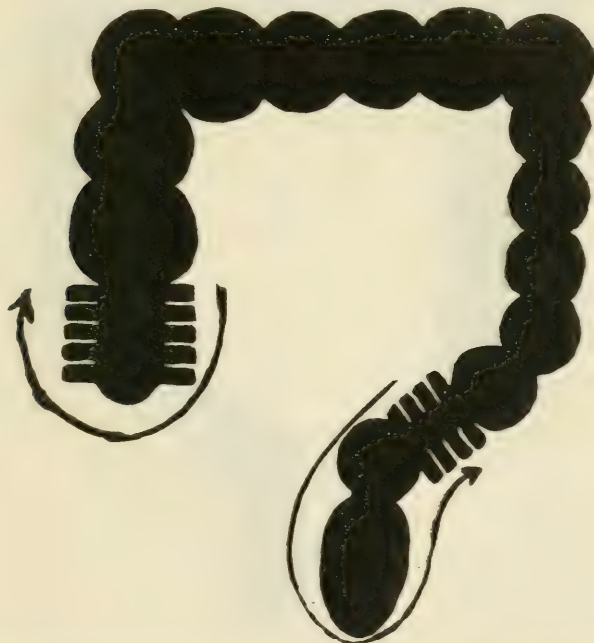
healthy intestinal flora are factors tending to prevent disease and prolong the health span of man.

THE DIAGNOSIS OF ENTEROCOLITIC INFECTIONS

It is believed that prevalent conceptions regarding the relation of focal infection to systemic disease have been too circumscribed; some placing the blame exclusively on dental and tonsillar infection,

and others on constipation and auto-intoxication. The investigations of Eggston and myself, which have been published, have led me to believe that there is a co-existence of focal infection throughout the digestive tract, for example, dental or tonsillar infection is associated, in the majority of instances, with a gall-bladder or colonic focus. The extension of upper digestive tract infection to its

FIG. 4.



This figure graphically illustrates the progress of the peristaltic waves to a point beyond the colonic flexures, the arrows indicating the direction of the peristaltic waves. The segments previously contracted are now relaxed, as the waves approach the termini—the cæcum and the rectum. (Schematic representation.)

lower levels, or the co-existence of focal infection in the upper and lower digestive tract have been inadequately studied. The removal of dental and tonsillar foci is not productive of results, in many instances, because of the failure to recognize the presence of associated intestinal infections, and the part that these hidden infections play in the production and perpetuation of systemic syndromes.

Moreover, intestinal infection may occur during the course of an acute infectious disease and survive, in an attenuated form, after all manifestations of the acute disease have disappeared. Focal

infection of the lower intestinal tract has been designated by Eggston and myself as "occult foci of infection," and we have devised a technic for obtaining faecal contents from the higher levels of the colon for cytological, toxicological and cultural studies. Normally

FIG. 5.



The peristaltic waves have now reached their termini. Arrows indicate that the directions of the waves are changing and that the second phase of the peristaltic cycle is beginning, i. e., a propulsive wave from the cæcum to Cannon's ring and a reverse wave from the rectum to Cannon's ring. During irrigation the intrarectal pressure is raised by two factors: (1) The rate of flow of the instilled fluid; (2) the rate of travel of the peristaltic wave from Cannon's ring to the rectum. As the rectal pouch and sigmoid are ballooned out by the instilled fluid and as the peristaltic waves approach the distended portion of the gut, the patient develops an urgent desire to discharge the fluid. The fluid is allowed suddenly to escape through the tube which causes an instantaneous dissipation of the propulsive wave. There follows an interval of rest. During this interval the fluid finding less resistance in travelling upwards through the lumen of the gut than out of the colon tube, follows the line of least resistance. The next phase involving the left side of the colon is a reverse wave from the rectum to Cannon's ring. This wave propels the instilled fluid to the higher levels of the colon. (Schematic representation.)

defecated stools do not represent a true bacteriological picture of intra-colonic conditions because in the lower sigmoid and rectum the faeces lack moisture, the pabulum is exhausted, autotoxins are concentrated and autolytic phenomena present conditions unfavorable to bacterial metabolism. The colon is filled from the rectum

to the cæcum by a special irrigation technic, to be described presently, which utilizes the normal peristaltic cycle of the colon, and the specimen obtained for examination by this method represents an admixture of the faecal contents from all the levels of the colonic

FIG. 6.



The arrows indicate that the peristaltic waves have now definitely reversed their direction and are travelling towards the point of origin, i. e., Cannon's ring. The cæcal contents are propelled into the ascending and transverse colon. The contractile intensity of the right wave seems to diminish after it passes the hepatic flexure, gradually fading as it again approaches Cannon's ring. The wave in the left side of the colon propels instilled fluids into the transverse colon. This wave also diminishes in contractile intensity after passing the splenic flexure and is gradually dissipated by the time it reaches Cannon's ring. Normally, the right wave admixes the cæcal contents while the bacteria perform their carbohydrolitic function. At the end of each peristaltic cycle a portion of the contents in the right half of the transverse colon passes through Cannon's ring, a structure with a function analogous to that of the pylorus, and after the requisite amount of water is absorbed, while the peristaltic cycles of the left side is in operation, it passes to the lower colonic levels in a semi-solid state and is moulded by the reverse waves of the left side. During irrigation the waves to the left of Cannon's ring seem to be more active than those to the right of this structure. When the patient is discharging the fluid, the reverse is true. (Schematic representation.)

tract. A study of the gross appearance, the toxicology, the cytology, the presence or absence of blood or mucus and especially the bacteriology, supply information which, when correlated with the clinical, sigmoidoscopic and other laboratory findings, determines the diag-

nosis of the presence or absence of occult foci. These foci are not detectable by X-ray examination. With this improved technic for the diagnosis of entero-colitic infection, a new phase of preventative medicine is made possible. The failure to recognize early the presence of intestinal foci is responsible for an unnecessary number

FIG. 7.



The peristaltic waves having passed through the colonic flexures, the contractile intensity is diminishing as it approaches Cannon's ring. (Schematic representation.)

of cholecystectomies, cholecystotomies, appendectomies, hæmorrhoidectomies, and the surgical correction for intestinal adhesions, sacculations, etc.

In considering the intestinal flora one must begin this consideration with a knowledge of the dietary constituents of the patients' daily fare. Broadly speaking, proteins encourage putrefactive processes; the carbohydrates, fermentative processes; and the fats

while apparently not capable of initiating a definite process, may intensify either a putrefactive, fermentative or pyogenic process. It is not believed that placing a patient upon the test diets is of any value because the flora is changed by the diet. We believe in obtaining a record of the quality and quantity of the average dietary

FIG. 8.



The peristaltic waves are finally being dissipated in the structure of Cannon's ring, the point of origin. During irrigation a portion of the fluid propelled into the transverse colon by the reverse wave from the rectum to Cannon's ring passes to its right, and is propelled into the cæcum by the next peristaltic cycle beginning at Cannon's ring. Normally, during digestion, the reverse is true. The cycle then repeats itself as in Fig. 1. (Schematic representation.)

of the patient, and in this way, one may appraise the excesses or deficiencies in the diet. The intestinal flora will, therefore, represent the average flora of the intestinal tract, which is not true when the test diets are used. I have classified intestinal floræ in reference to the predominating types of bacteria present as follows:

- (1) The acidophile flora dominated by *B. bifidus* and *B. acidophilus*, which is found in healthy breast-fed infants.
- (2) The aciduric flora dominated by *B. acidophilus* and non-

toxic strains of *B. coli*, which is found in healthy artificially fed infants, young adults and occasionally in older people whose diet has encouraged the growth of the protective types.

(3) The fermentative flora dominated by *B. coli*, *B. aërogenes capsulatus*, *B. lactis aërogenes* and some forms of streptococci and especially some members of the mucosus capsulatus group, which are excessively carbohydrolytic.

(4) Putrefactive flora dominated by *B. coli*, *B. putrificans*, *B. aërogenes capsulatus* and some forms of streptococci.

(5) Pyogenic flora which is subdivided into (a) simple pyogenic flora dominated by the pyogenic types; (b) pyo-fermentative dominated by the pyogenic and fermentative types and (c) pyo-putrefactive which is dominated by the pyogenic and putrefactive types.

The acidophile and aciduric floræ are normal to healthy intestinal tracts and are protective. The fermentative and putrefactive floræ metabolize chiefly the digestive residue and the intestinal secretions. The constitutional reaction to their activity is dependent upon the rate of absorption of their toxins and the ability or inability of the protective mechanisms to fix or bind or cleave their toxic products. Putrefactive states are believed to pave the way for actual tissue invasion by pyogenic organisms which establish foci in Peyer's patches, mesenteric lymphatics, the intestinal glands and the muscularis. Autopsy studies upon cases showing characteristic findings of intestinal infection showed the pathological changes to be a hyperplasia of the intestinal lymph chains, far in excess of the hyperplasia found in the upper digestive tract lymphatics. The intestinal mucosa is diffusely infiltrated with lymphocytes, eosinophiles and plasma cells with areas of polymorphonuclear infiltration with abscess formation. Cystic glands were also noted. In the more chronic cases, in addition to these findings, the submucosa was fibrous, the lymph follicles hyperplastic with a diffuse infiltration of mononuclear cells. The muscularis exhibited fibrous change with a thinning of the muscle, indirectly responsible for stasis, dilatation and sacculæ. The drainage of the infected intestinal area to the liver and spleen produced a fibrosis of these structures. The presence of mucus either free or admixed with the fæces, in which numerous bacteria, pus-cells and the goblet-type of epithelium are present, is

indicative of an inflammatory involvement of the intestinal mucosa. The epithelium may be bile-stained, suggestive of biliary tract infection. Pus-cells may be imbedded in mucus and are more numerous in drained than in undrained specimens of fæces for apparently they undergo rapid autolysis. Culturing the fæcal contents obtained by this technic upon a double-strength-meat-infusion-carbohydrate broth and incubating it for twenty-four hours, and if streptococci are found on the stained films, the fluid is subcultured upon blood agar plates, has demonstrated, in many instances, that the cultures were predominantly streptococcic. It is believed that the infections of the higher colonic tract levels are often predominantly streptococcic and that it is not possible to demonstrate the predominance of this streptococcic flora when cultures are made from a normally defecated stool because of unfavorable conditions just previously mentioned. For this reason, there is a predominance of the more native and facultative types in the ordinary culture study of the stool rather than a predominance of the distinctly foreign types. It is further believed that the streptococcic infection is not so much one of the fæcal contents, but rather an indication of actual infection of the intestinal tissues themselves. My reasons for this belief are based upon autopsy observations of Eggston and myself, which have supported the contentions of many investigators, notably, Draper,³⁵ Satterlee,³⁶ and Cotton.³⁷ Since these foci are not satisfactorily demonstrated by X-ray methods of examination, the laboratory findings are highly suggestive and when correlated with a general clinical study, are a most important laboratory contribution. This difference of cultural phenomena obtained from a drained stool specimen and a normally defecated specimen offers in part an explanation either for the success or failure of autogenous vaccine therapy. By correlating these studies we are in a position to determine to some extent the nature of the intestinal processes. In many instances, I believe it possible to prognosticate the development of pathological end-results by an examination of the intestinal flora with as much accuracy as we prognosticate the occurrence of rheumatism or heart disease, or what not, from infected teeth or tonsils.

CORRECTIONAL THERAPY

Correlating these facts, it appears that digestive tract pathology is due, in many instances, to a deficiency of minerals and vitamins, especially vitamin C, which is further intensified by an improper balance of food, especially an excess of starches and sugars and fats. A study of the infection history of the majority of my cases has suggested that the focal infections resulting from the prolonged use of faulty food and a poorly balanced diet are first obviously manifest as focal infection occurring in dental tissues, tonsils, sinuses and respiratory tract. In studying manifest gall-bladder and intestinal infection, I have been impressed with the history of the number of acute recurring infections involving chiefly the upper digestive and respiratory tracts, or by the presence of chronic focal infection of these tracts, which apparently preceded the infection of the lower intestinal canal. At least, focal infections in these structures occur apparently before there has been any manifest involvement of the intestinal tract; this may be explained by the survival of the protective forms of intestinal bacteria in these instances. From these observations, the problem of the treatment of intestinal infections involves not only the problem of the local intestinal pathology, but also the pathology throughout the extent of the digestive tract, and I have formulated five principles which may be applied successfully in the treatment of these lower intestinal tract infections.

(1) A diet rich in proximate food principles, and especially in vitamin C and necessary minerals, with a restriction of the readily digestive forms of starches and sugars and the quantity of fat. The diet may be fortified with the less readily digestible forms of sugars, as lactose and dextrine, which encourage the proliferation of the protective intestinal types.

(2) The removal or correction of focal infections in dental tissues, the tonsils, sinuses, respiratory tract, gall-bladder and small intestine.

(3) Acidophilization of the intestinal tract by the oral administration of milk cultures, fortified in some instances by the instillation of this organism directly into the colonic tract.

(4) The non-surgical mechanical drainage of the colon.

(5) Autogenous vaccines in selected cases.

It would be useless to enter into a discussion of the diet, as you know the substances rich in vitamins, minerals, lactose and dextrine. The patient can be depended upon to eat a sufficient amount of carbohydrates, and should be cautioned as to taking a requisite amount of protein which is obtained best from the flesh of animals that have been slaughtered recently.

It is also needless to state to you the orthodox measures employed in the correction or removal of focal infection about the teeth, tonsils, sinuses and respiratory tract. Very few of us are not acquainted with the work of Lyon,³⁸ Smithies,³⁹ Whipple⁴⁰ and others in respect to the diagnosis and correction of gall-tract and small intestinal tract infection.

The non-surgical mechanical drainage of the colon is a new technic for accomplishing what has heretofore been known as a high intestinal irrigation. The technic takes into account the peristaltic cycle of the colon which enables one to fill the colon throughout its extent with the irrigating fluid.

THE PERISTALTIC CYCLE OF THE COLON

Peristaltic contractions of the colon are initiated by the passage of food residue into the cæcal pouch or the dumping of faeces into the rectal pouch. The introduction of fluid into the rectal pouch is an artificial measure for stimulating colon peristalsis. The peristaltic pace-maker seems to be situated in the mid-portion of the transverse colon at a point commonly known as Cannon's ring. During irrigation, when the rectal pouch is distended, the peristaltic contraction begins at Cannon's ring, splitting into two contraction waves, one travelling towards the cæcum and the other towards the rectum. During irrigation we are concerned with the contraction wave travelling towards the rectum, which, when approaching the rectum, increases the pressure of the fluid instilled within the rectum, which creates a desire for defecation. The flow of fluid is then reversed, and instead of flowing into the rectum, it is allowed to escape through the tube into a waste receptacle. The sudden decrease of the intra-rectal pressure causes an instantaneous dissipation of the contraction wave and reverse peristalsis sets in, propelling the fluid remaining in the rectum and sigmoid to the higher levels of

the colon. This is re-enacted until the reverse peristalsis of the lower colon has propelled the fluid into the right half of the transverse colon, when the next stimulus promoting peristalsis will cause the portion of the contraction wave, which is a reverse wave from Cannon's ring to the cæcum, to fill the cæcum with the instilled fluid. The fluid can be demonstrated in the transverse colon and cæcum by succussion sound or by auscultation. This procedure is kept up until the colon is filled from the rectum to the cæcum, and it is possible for the colon to retain from a gallon to a gallon and a half of fluid. This requires from five to seven minutes' time. The patient is then allowed to go to stool and it requires from fifteen to thirty minutes to empty the colonic tract, the colonic peristaltic cycle being this: A propulsive wave from Cannon's ring to the rectum; a reverse wave from Cannon's ring to the cæcum; a mildly propulsive wave from the cæcum to Cannon's ring; and a mildly reverse wave from the rectum to Cannon's ring. Whenever a portion of the cæcal contents is disgorged to the left side of Cannon's ring, it is expelled during the next cycle. This peristaltic cycle explains the churning motion of the cæcum and the molding function of the descending colon and sigmoid. (Figs. 1 to 8.)

This briefly describes what is seemingly a complicated technic, but one which, when mastered, is rapid, efficient, and devoid of much of the unpleasantness that attends the usual high irrigation. It is designated as a mechanical drainage because that is the prime purpose of its administration. In addition to its diagnostic and drainage value, it is useful in a correctional way, as for hydrostatically stretching adhesions or straightening out angulations of the colon. This is a very painful and dangerous procedure, which should not be attempted until after the physician has had enough experience to formulate that intangible something called judgment, before subjecting his patient to this non-surgical procedure.

Acidophilization of the intestinal tract is believed to be most efficiently accomplished by the administration of milk cultures of *Bacillus acidophilus* prepared either by the Rettger or the Eggston-Norman technic, which insures a high numerical count. In some instances, the organism is instilled directly into the rectum. The oral administration is, however, the most valuable and the one to be

recommended. Occasionally, there are cases in which the colon bacillus appears to be absent from the intestinal flora. This is especially true when the flora is predominantly streptococcic, and in some cases, we combine non-toxic strains of colon bacillus with the acidophilus. The colon bacillus is readily implanted into the intestinal tract. It is believed that the colon bacillus may be either a helpful or harmful organism, depending upon its microörganic associations.

Autogenous vaccines are prepared from the cultures of the faecal contents obtained during drainage, and are combined with cultures taken from other foci, as teeth, tonsils, etc. The initial dose is small and it is gradually increased every fourth day, until a very large dose is reached. It is given for a long period of time. If there are any unfavorable reactions, the dose is diminished and we cautiously reapproach the dose level which provoked the unfavorable reaction.

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THE TREATMENT OF CONSTIPATION *

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I HAVE some misgivings in selecting constipation as the subject for our discussion, as I have in mind the remarks that some of you have made in the dispensary where constipation leads in the series of complaints to which we must give our ear. Yet constipation offers for study principles of therapeutics replete with instruction and interest. It involves a consideration of complicated causal influences and the use of a variety of therapeutic agencies, including diet, psychotherapy, mechanotherapy, rectal medication, electricity, hydrotherapeutic measures and drugs.

A daily and sufficient evacuation of the bowel is considered the normal condition for most individuals. A less frequent result associated with an insufficient amount of hard faecal matter constitutes constipation. Strictly speaking, the definition is not correct, for there are individuals in whom evacuation occurs regularly two or more times a day, and there are others in whom the bowel moves at less frequent intervals without constituting a pathological state.

Thus, I had occasion to see a well-nourished, healthy young girl who in spite of her protest that nothing was wrong was brought to me by her mother for the relief of what the mother termed constipation. The bowels moved once a week or once in ten days, and then by the use of an enema. The girl had no complaint, was perfectly comfortable and was reluctant to adopt my suggestions. I instituted the treatment by means of oil enemas which produced an evacuation every other day. During this period she began to suffer much abdominal pain, and was far more uncomfortable than under the old habit, and at her request I discontinued the treatment and she resumed the regularity of once a week, to which she had been accustomed.

* Abstracts of three Clinical Lectures delivered at the Johns Hopkins Hospital on November 14, 21, and 28, 1922.

TRANSITORY CONSTIPATION

Constipation may be acute and transitory, or chronic and habitual. We shall devote only a little time to the consideration of transitory constipation. It may result from any departure from the usual routine of life: a journey; the suppression of a desire to move the bowel at the regular time; an acute illness, medical or surgical; inactivity as well as unusual exercise—all these and many other conditions may cause a transitory constipation. Such constipation rights itself, or the use of one of the laxatives, which we shall enumerate later, remedies it.

HABITUAL CONSTIPATION

It has been suggested that habitual constipation may have as its causes:

- (1) Disorders of the intestines or of its contiguous structure.
- (2) Faulty intestinal contents.
- (3) Disorders of habit.

Disorders of the Intestines or of its Contiguous Structures.—Of the first class I shall not discuss in detail organic causes such as intestinal neoplasms, luetic intestinal stenosis, the pressure of a retroverted uterus or of a pelvic tumor, the presence of hemorrhoids or anal fissures. Let me mention the megalocolon of childhood (Hirschsprung's disease) as an organic cause of obstinate constipation. From our discussion I likewise exclude other organic conditions such as the circulatory disturbances encountered in heart disease and in cirrhosis of the liver. The possibility of these organic conditions constitutes the advisability of obtaining a complete history of the case and of making a careful physical examination, never neglecting palpation of the rectum. An aid in the diagnosis of obscure cases is the X-ray, by means of which bismuth may be followed at intervals and abnormalities of the bowel graphically depicted on the plate.

I limit myself in this first division to the functional incapacity of the bowel to move its contents onward towards the outer world. A subdivision of an atonic and spastic constipation is made, but in practice we have to deal as a rule only with the atonic or hypotonic, although a combination of the two conditions is probably present in

many instances. The constipation of lead poisoning is taken as the type of spastic constipation, and here we find the paradoxical situation where opium and belladonna relieving intestinal spasm allay constipation. This spastic constipation is that which may be encountered in highly neurotic individuals.

Faulty Intestinal Contents.—There is much that is yet unknown concerning the relation of intestinal contents to constipation. Too scanty a mass of residual intestinal matter will fail to excite peristalsis and too hard a consistency may likewise lead to constipation. Besides the mechanical proportions the chemical and thermic characteristics of food and food residue play a rôle in favoring or restraining intestinal movements: they are said to be euperistaltic or antiperistaltic.

Disorders of Habit.—Another cause, and a frequent one at the inception of habitual constipation, is the suppression of a desire to evacuate the bowel at a normal time. This desire is rhythmically produced by a rising pressure in the rectum as a result of the accumulation of fæces, yet the desire may be suppressed by the will. The routine established by habit may be broken, an incomplete evacuation is apt to follow, a residual fæcal accumulation results and an atony from distention may succeed. Finally, at this point, it may be stated that constipation is a family tendency.

The symptoms of constipation vary extremely. There may be no subjective complaint aside from the infrequent movement. On the other hand, we encounter headache, dizziness, flatulence and burning abdominal pain, which are relieved by regular evacuations. Gastric symptoms are frequent: burning sensations, fulness and pressure in the epigastrium and a great host of nervous phenomena; palpitation, irritability of temper and depression are occasional manifestations. The constipation and the gastric and neurotic symptoms are, I believe, frequently evidences of the same underlying cause rather than cause and effect, and reveal a general lack of tone in the nervous system. Constipation is a symptom for which the diabetic in particular seeks relief. In chlorosis it is so common a symptom that it has been accorded a causal rôle. Sir Andrew Clark is quoted as saying that if he were limited to one class of drugs in the treatment of the "green sickness" he would choose a purgative rather than iron.

A matter of some practical moment is the question of constipation as a cause of fever. It is usually accepted that in children a rise of temperature may occur, but surgeons regulate their practice on the hypothesis that an acute retention of fæces may elevate a temperature already slightly above normal. It is very doubtful, however, whether in an adult incomplete constipation can produce fever.

This short list of symptoms due to constipation is at variance with the well-known views of Sir Arbuthnot Lane, who attributes "the greater part of the sickness of the world" to intestinal stasis or constipation. The symptoms and signs which Sir Arbuthnot attributes to alimentary toxæmia as the result of intestinal stasis would fit the conception of what in this country we attribute to focal infections. Those of you who wish to have the details of the subject will find them in the report of a discussion on "Alimentary Toxæmia" before the Royal Society of Medicine reported in the *Lancet* and *British Medical Journal* of 1913.

Since Metschnikoff's suggestion as to the part played by fermentation, putrefaction and absorption from the large intestine in the production of arteriosclerosis and the elaboration of these suggestions by Sir Arbuthnot Lane the list of symptoms has increased manifold. Intestinal stasis has come to be practically synonymous with constipation, and intestinal stasis is held in part responsible for "the greater part of the sickness of the world." If I should give you the list of disorders which have been attributed to an alimentary toxæmia the result of intestinal stasis according to the views of Sir Arbuthnot Lane, it would include emaciation, cutaneous pigmentation, subnormal temperature, depression, insomnia, neurasthenia, neuralgia, neuritis, low and high blood-pressure, degenerative changes in the breast, pancreatitis, nephritis, myocarditis, arthritis (acute rheumatoid), and many more direct and indirect sequelæ. However, the bacteriologists' and chemists' investigations in regard to the nature of the poisons involved have yielded scant positive results. The tendency to use such terms as alimentary toxæmia and intestinal autointoxication is not to be advocated, although further observations, clinical and laboratory, on the possible association of constipation and symptoms should be encouraged.

Some psychiatrists describe a variety of constipation in children who exhibit a voluntary retention of feces with, according to the psychiatrist's opinion, a consequent pleasurable sensation in expelling the larger accumulation. The psychiatrist ventures as his opinion that this habit is a premonition of subsequent eccentricity or neurosis and plays an important part in the development of the constipation of some neurotic patients. At this point I want to tell you that while this opinion seems very bizarre, yet you will meet every now and then constipation in little children which is undoubtedly of psychic origin. I mean by this that the "bowels" are discussed so much and so often in the household that the child who is constipated begins to feel that there is a certain distinction in the habit and they really retain their feces, not because it gives them any pleasurable sensation but because I believe they acquire subconsciously a sense of power over their environment. It is so with habitual loss of appetite in little children. There is a group of children who will not eat. They soon learn that this characteristic is a mark of eminence in the household. It may be discussed in their presence whenever anyone comes into the home and I think they take advantage of it without knowing it as a source of power over their elders.

The physical examination of patients suffering from functional constipation often yields little information. Doughy fecal masses may be palpated, particularly in the iliac fossæ, and the percussion note over these regions may be a little dull. Where spasticity is present the contracted bowel, more particularly the sigmoid, may be palpable.

In the causes associated with splachnoptosis the physical signs of this condition may be disclosed. In some cases it may be advisable to call to assistance the X-ray and the shadow of the bismuth meal may give valuable evidence.

DIET AS A CURATIVE MEASURE IN CONSTIPATION

It would seem appropriate to consider the treatment of constipation under headings corresponding to the three groups of causes and discuss measures for increasing the tone of the intestinal neuro-muscular mechanism directly, for establishing euperistaltic gastric and intestinal contents and finally for reëstablishing regular habits of

defecation. As a matter of practice all three groups of causes are or have been operative and our measures for their relief also overlap in their action.

It is, therefore, more satisfactory to consider the curative measures apart from etiologic influences, and we shall in the first place discuss the effect of diet as an agency in the relief of the condition under discussion.

In arranging the constipation diet it is necessary to take into consideration the properties by virtue of which it may stimulate peristaltic action. It may act in this way by its mechanical effect when food is employed which leaves an indigestible residue. It is in this way that vegetables and whole wheat bread act. Furthermore, food may favor peristalsis by its thermic stimulation. This is particularly true of the very cold or very hot articles of diet, and they act more vigorously when the stomach is empty. Besides the mechanical and thermic stimulating effect, food has a euperistaltic action by virtue of its chemical constitution. From this standpoint Boas has grouped alimentary substances as follows:

- (1) Substances containing sugar: Cane sugar, manna, honey, syrups and fruits.
- (2) Foods containing organic acids: Buttermilk, kumiss, kefir, apples, cider, cherries and rye bread.
- (3) Salty substances: Salt and salty foods.
- (4) Substances which contain CO_2 or develop CO_2 : Sparkling waters, sour milk preparations, cabbage family.
- (5) Substances which contain fat and in which the amount of fatty acids assist their action: Butter and olive oil.

From these remarks and from this table the constipation diet can be constructed if the additional caution be given that certain foods free of antiperistaltic action or astringent influence must be avoided. Thus, strong tea and clarets rich in tannin are excluded as well as rice, cocoa and blackberries.

The following is an outline of a routine constipation diet. On rising, the patient is recommended to drink a glass or two of cold water in each of which a lump of sugar is dissolved. For breakfast fresh fruit, oatmeal, graham or cornbread with butter and honey or syrup are the articles of food which would favor peristalsis. One-third of bran may be added to the breakfast cereal, or a tablespoonful of powdered agar-agar may be similarly used. For the other two meals graham bread is also advised as a substitute for wheat bread. At these meals stewed fruit and vegetables should be eaten freely. Salads should be prepared with much oil. At bed-time one or two apples are eaten—during the day one or two glasses of buttermilk or of cider may be drunk. At times the free use of sweets, vegetables and fruits causes some flatulence, but this discomfort will disappear if the patient can be persuaded to adhere to the diet until the intestine accommodates itself to the new condition.

PSYCHOTHERAPEUTIC METHOD OF TREATING CONSTIPATION

This leads me to speak of a second measure for the relief and cure of the habitual constipation of adults. It is the method of persuasion and suggestion known as the psychotherapeutic method. I have spoken of one of the causes of constipation as an interruption of habit. Among the conditions which contribute to it is the rush of the morning hours or the departure from the routine of life caused by travel, and the consequent suppressing of a desire to evacuate the bowels. A retraining is necessary, and many have regained the habit by following the advice to attempt persistently and daily at a fixed hour, usually within an hour after breakfast, to move the bowel. This same method of persuasion and suggestion in restarting the habit of defecation has been developed to its utmost by Dubois and his followers. It is peculiarly suitable to the treatment of constipation in neurasthenics and psychasthenics, but even in these cases it is to be combined with the constipation diet. In practicing this method the prerequisite is that the physician should carry entire conviction in his advice. Each patient requires individual attention, but the positive statement that the constipation can be cured without the aid of drugs is taken in all. The details can be found in Dubois' "The Psychic Treatment of Nervous Disorders," but in brief the method can be here described.

The patient is positively assured that her constipation can be cured without medicine. She must discontinue purgatives at once. She must conquer her constipation by force of will and cause a movement of the bowel each morning after breakfast. You then give her a series of reasons why the hour after breakfast is the normal time for defecation. In the first place, you say the slow movements of the intestine acting during the night bring the stool down into the rectum by morning. In the second place the act of awakening is in itself a stimulus to peristalsis, and you may cite the cases of individuals in whom the mere act of awakening is accompanied by a desire to go to stool. You will urge that the putting on of the clothes is a further stimulus, acting as a kind of abdominal massage. The drinking of cold water is a fourth "invitation." The eating of breakfast is a fifth factor in establishing the morning hour as the proper time; while a sixth "command" is the habit of going at a fixed hour immediately after the morning meal. If this method is carried out impressively and with assurance the results are at times extremely striking and successful. In the case of the wife of a physician successfully treated in this way she analyzed the method of cure. I had described to her the reasons for the morning hour as the proper time for the intestinal evacuation, and had gone over Dubois' six "invitations." I had added the additional suggestion that should there be an inclination to stool at any other time of the day that she should suppress the desire and not allow a movement until the next morning after breakfast. In the course of a week she was quite regular, although previous to the psychotherapeutic séance she had been accustomed to take cascara every night. The day after my visit the bowel failed to move, but I had so thoroughly assured her that no harm could come from the absence of the evacuation that she did not worry, and abstained from the usual dose of cascara that night. As predicted, the bowels moved the following morning after breakfast.

MECHANOTHERAPY IN TREATING CONSTIPATION

Another method of treatment destined to establishing a regular habit of evacuating the bowel involves mechanical aids.

Mechanotherapy, applied through the abdominal wall.

- (a) Exercise.
- (b) Massage

}	manual
	automassage
	vibratory
- (c) Removal of impaction.
- (d) Enemas.
- (e) Abdominal supporter.

Exercise.—The object of exercise is to secure a stimulation of peristalsis and an eventual permanent increase in the tone of the intestine musculature, the strengthening of the abdominal muscles. Walking, rowing and golfing are sometimes the appropriate exercises. Horse-back riding is particularly efficacious.

These methods are not always applicable, and in their place a course of morning exercise can be carried out in the bedroom. It is better to give these directions in written form. Thus, after taking the cold and sweetened water, as already directed, the patient is directed to exercise as follows:

- (1) Standing erect, bend the trunk forward without flexing the knees until the tips of the fingers touch the floor. Resume the erect position in a similar manner.
- (2) With hands clasped behind the head in an erect position rotate the body on the hip.
- (3) In the same attitude the thighs and legs are flexed and extended as if a squatting position were to be formed, but return promptly to the erect position.
- (4) Lying on the bed with hands folded across the chest and the tips of the toes under the head of the bed to keep them down, the trunk is raised to a sitting posture and then slowly lowered.
- (5) Exercise (4) is reversed by raising the stiffened limbs until at right angles to the body, then lower.

- (6) Stand up and lean forward, then draw in the abdominal wall by deep inspiration, following it by a deep expiration.

Manual Massage.—With the same object which we have in view in advising these exercises, abdominal massage may be prescribed. Many trained masseurs offer their services in the large cities. At the outset arrangements should be made for a six weeks' course. The massage is given daily, at *first for fifteen minutes, gradually lengthening the treatment to a half hour.* The ideal time for abdominal massage is the morning before breakfast, for it is this period when we should concentrate all of our invitations, to use Dubois' term. The morning hour is not always convenient for the masseur, in which event the treatment is undertaken at another time when the stomach is empty. The technic may be best learned by watching an experienced masseur, although the books on massage describe it clearly.

Automassage and Vibratory Massage.—Manual massage is costly, but when it is deemed advisable and the expense is a contraindication automassage may be substituted. The apparatus is a ball weighing about five pounds, covered with leather, and can be procured at the instrument makers. The patient on awakening and having voided lies in bed, and with thighs flexed guides the ball in rotary movement over the abdomen, ascending over the course of the ascending colon, across that of the transverse colon and down the left lateral abdominal region. These movements are repeatedly carried out. Then the ball is dropped more or less gently over the abdomen here and there. The massage should last fifteen minutes. Vibratory massage may also be used.

Removal of Impaction.—Among mechanical aids I place digital removal of impacted fecal matter from the rectum. The history of fecal impaction is often misleading. The patient will affirm he has had a number of small liquid movements and yet the desire to empty the bowel is always present. On examination of the rectum it will be found plugged with fecal matter. The finger protected by a rubber cot will break up the impaction and an enema of soapsuds will bring the mass away.

Enemas.—The use of enemas is a common practice for the relief of habitual constipation, especially in the variety that has been designated as torpor recti dyschezia. The passage through the colon is practically normal but there is abnormal distension of the rectum with fecal matter as a result of deficient rectal function. The usual enema is warm and a quart is the average quantity employed. An objection to the continued use of large enemas is that they distend the bowel and thus increase the atony, which we are combatting. The employment of cold water overcomes this objection, because one-half to one pint at a temperature of 70° to 50° will stimulate the rectum to action. The cold enemas are particularly indicated when hæmorrhoids or bleeding fissures are present.

Medicaments may be added to the water and of these glycerin is one of the most satisfactory. An enema of three ounces each of glycerin and soapsuds does not distend the bowel and is effective. Glycerin in the shape of suppositories is like the small cold water enemas, a valuable adjunct in the routine treatment of constipation for temporary relief while waiting for the results of the dietetic and other measures. So, too, are olive-oil enemas. A member of the family is instructed in the method or a visiting nurse is called to administer it. Olive or cottonseed oil is used. The apparatus consists of a glass funnel, a rectal tube and a tumbler. The time selected is just before retiring. The patient is given a cleansing enema of warm soapsuds. Then, the bed being protected by a pad, the rectal tube armed with a glass funnel is introduced into the bowel for about six inches. The olive oil, having been warmed, is slowly allowed to flow. From six to ten ounces is thus introduced. The attempt is made to retain it all night. The next day the bowels move. The oil injection is made every other night. Later, as the other measures begin to act, the quantity of oil and the frequency of the treatment are reduced.

Abdominal Supporter.—Finally, another mechanical aid in the treatment of constipation is the abdominal supporter in those cases associated with visceroptosis and a lax abdomen. In these instances not only does atony play a part but from results of X-ray examination and of the examination of the bowel in cases where the abdomen has been opened it becomes clear that “angulation”

and other distortions of the misplaced bowel may lead to temporary obstruction.

ELECTRIC AND HYDROTHERAPEUTIC MEASURES FOR THE RELIEF OF CONSTIPATION

Electric and hydrotherapeutic measures are best carried out in hospital or sanitarium whither some of the neurogenous variety of constipated patients find their way. I have had little experience in these methods. A variety of electric currents have been advised, and they are applicable both through the abdominal wall and in the rectum. Through the abdominal wall a combination of galvanic and interrupted currents is recommended. A large flat positive electrode is placed beneath the patient and a cathode roller is passed over the abdomen for five minutes, the current being strong enough to excite contraction of the abdominal muscles. It is said that from six to fifteen sittings suffice for the relief of the constipation.

A cold spray directed against the abdomen each morning is sometimes serviceable and can be applied at home by means of an attachable douche tube. The free use of cold water by mouth is to be commended. A lady whom I had attended for the relief of constipation assured me that it was cured by the drinking of eleven glasses of water and abstaining from drugs. Four glasses were drunk before breakfast, two between breakfast and lunch, two during the afternoon and three at bed-time.

DRUGS IN THE TREATMENT OF HABITUAL CONSTIPATION

I pass now to the rôle played by drugs in the treatment of habitual constipation. The ideal treatment as I have indicated is to cause a regular movement of the bowels without the use of cathartic drugs, best accomplished by the application of dietetic measures, regular habits and appropriate exercises, but such an ideal cannot be reached in a large proportion of cases and recourse must be had to drugs.

Indications for Purgatives and Laxatives.—At this point I am going to take the opportunity of discussing the indications for the use of purgatives, modifying for this purpose a list prepared by Gant. At the head of the list I shall place their use in the treatment of habitual constipation as temporary adjuvants while the other mea-

tures, dietetic, psychic, and mechanical, are becoming operative. These other measures may never become operative and so as a second indication I shall consider the use of purgative drugs as justifiable where the measures that we have previously discussed are impracticable or ineffective. They are impracticable in the aged; they are not feasible in many invalids and in the insane, and they are ineffective in many habitually constipated patients otherwise normal.

A third indication for purgatives is the relief of transitory constipation.

At the onset of some diarrhœas they are used. I am happy to say that in cases of diarrhœa in infants purgative drugs are now much less frequently administered than they used to be. In former days calomel was exhibited whenever a child had diarrhœa and I judge it did much harm.

You will have your ingenuity taxed, when you become an interne, in the use of laxatives in post-operative and post-partum cases.

Purgative drugs are frequently used at the onset of acute infections. In gripe it is a very common routine practice to initiate the treatment with a purgative.

Cathartics are constantly being used in cardiac and hepatic disorders. I remember when in charge of Ward M that patients suffering from the result of cardiac decompensation received compound jalap powder as gratefully as they did digitalis.

In some gastric disorders a laxative such as magnesia is frequently administered. Its antacid quality as well as its laxative properties contribute to its value. The pylorospasms of various origins are a fertile field for the use of antacid powers of which magnesia is usually one of the constituents.

Purgatives are also used following the administration of opium derivatives. If you give a hypodermic of morphia for any reason during the night, the following day a purgative is indicated. This list, while not covering all the indications, will serve as a working basis for the use of purgatives.

Groups of Purgatives.—For purposes of discussion a classification of purgative drugs into four groups has been suggested.

In the first group (A) I shall place those which tend to prevent the absorption of liquids throughout the intestine. They include the saline cathartics and calomel.

Of saline cathartics that are widely employed, *sodium phosphate* is frequently used, either as such or in the effervescent form. The dose is from two teaspoonfuls to a tablespoonful. The effervescent form is sold in bottles with a measuring cap representing the average dose.

Then there is *sodium sulphate* (Glauber's salts) of which a tablespoonful is a dose; *magnesium sulphate* (Epsom salts) of which a tablespoonful is the average dose; the *double tartrate of potassium and sodium* (Rochelle salts), dose, a tablespoonful. Rochelle salts may also be given in the form of the Seidlitz powder.

Of the saline laxatives perhaps the most popular is *citrate of magnesia*, of which the bottle of twelve ounces is the amount to be taken, divided into two parts with an hour's interval between doses.

Milk of magnesia, officially known as *magma magnesiæ*, is serviceable in the constipation of children, the dose being from one teaspoonful to two tablespoonfuls. Calcined magnesia finds its chief indication in the constipation of some gastric disorders. The dose is from five to sixty grains.

With the exception of milk of magnesia, saline laxatives are best administered in the morning before breakfast. The dose of the powder is placed in a dry glass and cold or hot water is added in quantity just sufficient to dissolve it.

These saline laxatives are also used in the form of aperient waters. Before the war Hunyadi Janos and Apenta waters were much in use. Since then Pluto water has largely replaced them in this country. Of Pluto water the average dose is two and a half ounces with the addition of an equal quantity of hot or cold water.

Carlsbad salts, both natural and artificial, are much employed. The artificial preparations are usually effervescent and quite palatable.

A very elegant laxative is *Tamar Indien*. It is marketed in the shape of compressed lozenges and is the fruit of *tamarindus indica*. Its cathartic properties depend on the tartrate, malate and citrate of potassium. Tamars are ordered by the box and one-half to two pastilles are taken at bed-time.

Calomel.—Calomel belongs to this group (A), for it, like the salines, tends to prevent absorption of liquids from the bowel. Calomel is frequently employed, as I mentioned a moment ago, as a purgative in the digestive disturbances of children and likewise in

post-operative convalescents. It may be given in tablets, as a powder, or in the form of the compound cathartic pill, of which it is one of the ingredients. This pill is an unnecessarily complex mass and some of us who are interested in the Pharmacopœia would really like to delete it, but the war has made it so popular that I do not think we shall be able to remove it for another ten years. The compound cathartic pill contains approximately a grain of calomel, a fact which its name does not suggest and of which the laity and many practitioners are not aware. Recently I saw a lady at the Belvedere who came here to see Doctor Brewer, the dentist, for the relief of gingivitis. It was very obscure in origin and Doctor Brewer suggested that I make a physical examination. At the time I saw her she was very wretched; she had swollen gums that bulged between the teeth, almost covering some of them, and this condition had been present for several weeks. She had consulted dentists several times during the last few years because of a similar condition. On my inquiry it transpired that she was habitually constipated and that she had been taking compound cathartic pills, one or more every night, for a series of nights during several years. It was not very difficult to make the diagnosis of the mercurial origin of the gingivitis.

There is a groundless dread lest bichloride of mercury be formed in the stomach while taking calomel without the combined use of bicarbonate of soda. There is no room for this fear. Neither is it necessary to follow the tradition that the acids of fruits are harmful during the administration of this drug. The reason that we are not poisoned by calomel is probably due to the fact that soluble albuminates are formed which are very slowly absorbed and poisoning is thus avoided. Calomel stimulates the secretions of the intestinal mucous membrane, fluid accumulates in the bowel, there is inhibition of absorption and diarrhœa results. The fluoroscope has been invoked to study its action and has demonstrated an increased peristalsis of the small and large intestines. By some it is assumed that biliverdin is not reduced to biliprasin owing to the disinfectant property of calomel, for which reason the stools are green, while others attribute the green color to the presence of sulphide of mercury. To the laity and to some practitioners the green movements are conclusive evidence of calomel's action on the liver—a deduction

which unfortunately has no basis in fact. Calomel is exhibited as the tablet triturate in 1/10 grain doses. A tablet is given every half hour until ten or fifteen are taken. A powder or capsule of calomel containing from two to five grains may be ordered. Five grains may be given in a powder, and should be taken at bed-time. About eight hours after giving calomel a saline purgative should be used; the routine is a Seidlitz powder. Do not be afraid of calomel in large doses. You can salivate a man more quickly with a small dose every half hour than with a single large dose. *À propos* of large doses let me quote from a little volume entitled "Rough Notes on Remedies" by an English physician, Doctor Murray. Murray was accustomed to treat patients suffering from acute mania with calomel in this wise. On such occasions he would carry with him a bottle of chloroform, a box of calomel and a teaspoon. He tells us, in the treatment of one such case: "I threw a towel saturated with chloroform over his head, and contrived to keep it there until the man was unconscious. I then administered a teaspoonful of calomel (which I afterwards made out to be about eighty grains) with the happiest result. As soon as we allowed him to regain consciousness, we saw that the man was subdued and occupied by his own internal sensations, and ere long his fury entirely left him. When purging and sickness set in he became perfectly limp, and was easily removed to an asylum, where he made a good recovery."

The moral is that you can give calomel in large doses without any harm.

Group B of purgative drugs comprise those which exert a motor action chiefly on the small intestines. They include: Castor oil (*Oleum ricini*), croton oil (*Ol. tiglii*), jalap, colocynth, podophyllin.

Castor oil in spite of its familiarly unpleasant qualities is still a favorite laxative for both children and adults. It is used in acute or transitory constipation, sometimes at the onset of acute infections and at the inception of diarrhœa. Many preparations of the oil have been presented to disguise its taste and consistency but individuals differ in their opinions as to their palatability. In the olden days you could sandwich with a little skill a dose of the oil between two layers of whiskey and you can still do it if you have the material! Or, the oil may be placed between strata of orange juice.

Croton oil is a drastic cathartic which is seldom used. In an individual of robust type lying in the coma of uræmia or of cerebral hæmorrhage, it is occasionally administered. One or two drops are mixed with a little butter, with olive oil or with granulated sugar and placed on the back of the tongue.

Jalap, too, is a vigorous hydragogue purgative used particularly in cases of anasarca and less extensive œdema accompanying cardiac decompensation. The dose is thirty grains of the compound jalap powder given at bed-time.

Colocynth belongs to the same group as jalap and with it is most often exhibited as the compound cathartic pill which in addition contains calomel and gamboge or camboge. The pill weighs three grains and contains:

Comp. extr. Colocynth,	about	gr. $1\frac{1}{3}$
Calomel,	" "	1
Resin of jalap,	" "	$\frac{3}{8}$
Gamboge,	" "	$\frac{1}{10}$

Another pill that contains colocynth is the Pil. Colocynth et hyoscyami (N.F.), one or two are given at bed-time.

The last member of this subdivision, podophyllin, is rarely used alone but is most often combined with aloes. Thus, the compound aloin pill contains:

Aloin,	gr. $\frac{1}{2}$
Extr. belladon.,	gr. $\frac{1}{4}$
Podophyllin,	gr. $\frac{1}{8}$

The compound cascarn pill also contains podophyllin. Its formula is:

Cascarin,	gr. $\frac{1}{4}$
Aloin,	gr. $\frac{1}{4}$
Podophyllin,	gr. $\frac{1}{6}$
Extr. belladon.,	gr. $\frac{1}{8}$
Strychnine,	gr. $\frac{1}{60}$
Oleoresin ginger	

One or two pills are taken at bed-time.

A third division (C) of purgative drugs, and this one is the most important in the treatment of habitual constipation, includes those which stimulate the large intestine. They include the anthracene purgatives. These owe their cathartic property to the presence of the anthracene compound ($C_{14}H_{10}$). Under this subdivision you

may include cascara, senna, aloes and rheum or rhubarb. In a second subdivision of this third group is placed sulphur which like the anthracene purgatives acts on the large intestine.

Cascara is used in several forms, a popular one being the extract. It is given in tablet form of one, two, three, four, and five grains. You may order the tablets chocolate covered, gelatine or sugar coated. The average dose is five grains at bed-time, many patients require ten. Of the fluid extract the average dose is one-half teaspoonful at bed-time. The aromatic fluid extract is more palatable, and one or two teaspoonfuls constitute the dose.

Senna is a very valuable purgative in the routine treatment of habitual constipation. It is used in the form of compound licorice powder. The purgative principle of this powder is senna. A heaping teaspoonful stirred in a half glass of water is the average dose, taken at bed-time. Senna is much used in children's practice in the form of a compound syrup containing figs. There is an official preparation of this fig syrup, but proprietary preparations are usually used in the household in its stead. A very good way of administering senna is in the shape of a confection. You take figs, dates, raisins and prunes, a quarter of a pound of each, mix them with about half an ounce of senna leaves, pass repeatedly through a meat grinder and then spread and roll the mass on a board that is well sugared, cut in cubes of about the dimension of an inch. They may be put in a tin box, kept in a cool place and a cube eaten at bed-time. There are many recipes which include senna as the active principle. A tablespoonful of senna leaves may be placed in a little muslin bag and soaked for an hour in the hot water in which a pound of prunes is being stewed. Three or four of the prunes with some of the juice are eaten at the evening meal. A simple method of using senna is to pick up a few of the leaves at bed-time and chew them while undressing. On going to bed swallow them with a full glass of water or with a dose of mineral oil.

Aloes is most frequently exhibited in practice as the Lady Webster "after-dinner" pills. From one to three pills are taken at bed-time. Nobody seems to know who this Lady Webster was. It would be interesting to know what sort of dinners she gave! Aloes is also used in the shape of the A. S. and B. pill. The official pill contains aloin, gr. $1/5$; strychnine, gr. $1/120$; extract of belladonna, gr. $1/8$.

One or two pills are taken at bed-time. In this part of the country various modified formulas of the aloin, strychnine and belladonna pills are much used. In one of these ipecac is an additional constituent.

Rhubarb has a secondary astringent or constipating effect and is usually prescribed with aloes. Of the compound rhubarb pill two to four are given at bed-time.

Sulphur is rarely exhibited except as I have said in the shape of compound licorice powder. Sulphur is available, however, in five-grain tablets, one to three are given in twenty-four hours.

Now comes the fourth group (D) of purgative drugs which comprises a series of miscellaneous preparations with laxative properties of varying degrees.

Perhaps no other preparation is now so widely employed in the treatment of habitual constipation as *liquid petrolatum*, liquid vaseline or paraffin oil. This mineral oil is without any chemical activity, but acts as a lubricant and is given in an average dose of two tablespoonfuls at bed-time. If not effective more is given in the morning or even during the day. Usually morning and evening doses are sufficient. In some cases it has the disagreeable quality of passing through the rectum without the voluntary action of the patient. In such a case you will select an oil that has a high viscosity.

Phenolphthalein in doses of from one-half to four grains in tablets, pills, capsules or powders is readily taken by children as well as adults. Phenolphthalein wafers flavored with wintergreen, colored pink, each of which contains one grain of the drug, are most widely known. Or, the drug may be prescribed as the official *Trochisci phenolphthaleini* (N.F.), each containing one grain of the laxative, one or two tablets at bed-time. Or it may be combined as follows:

Aloin, gr. $\frac{1}{4}$
Strychnine, gr. $\frac{1}{80}$
Extr. belladon., gr. $\frac{1}{12}$
Powdered ipecac, gr. $\frac{1}{12}$
Phenolphthalein, gr. $\frac{1}{2}$

Agar-agar is derived from Japanese seaweed. It passes practically unchanged into the intestine where it increases the bulk of the feces, keeps them moist and thus stimulates peristalsis. It is marketed in four-ounce packages and may be taken with milk or

cream or with a cereal breakfast food. The usual dose is one or two tablespoonfuls.

Pituitrin, in the form of the aqueous solution of the posterior lobe of the pituitary body, is injected hypodermically to relieve the atonic condition of the bowel after abdominal operations. The method usually practised is to give an enema, immediately following it by the subcutaneous injection of an ampoule of pituitrin.

Obstructive conditions following operative procedures are also treated occasionally by the hypodermic administration of *atropine sulphate*, gr. 1/60 to gr. 1/30 and likewise by a similar application of *eserine salicylate* in like doses. Both are obtainable in hypodermic tablets of 1/60 grain. *Eserine* may be used immediately after the operation in doses 1/120 grain every six hours, and occasionally before the operation.

SUMMARY

In the treatment of a patient suffering from habitual constipation you must individualize. If a patient who takes a tamarind each night and obtains a satisfactory result consults me I do not order massage and electricity but I advise her to continue taking the tamarind if such a simple measure has proved effectual. An elderly patient takes, with success, liquorice powder. She need not be dieted and exercises prescribed for her. Another will complain of the discomfort attendant on the constipation diet and has no time to exercise. For him it may only be necessary to drink a few additional glasses of water or take a few tablespoonfuls of bran with his cereal.

As a routine treatment it is advisable to use the constipation diet, to increase the amount of water drunk, to urge the cultivation of a regular habit of defecation, to employ one of the mechanical aids which we have discussed and to discontinue drugs.

To relieve the discomfort and empty the bowel during the early days of the cure you may advise the use of mineral oil or senna leaves, or both. A small cold enema or a glycerine suppository may be employed after breakfast in order to reëstablish a regular habit.

In spite of all efforts there will still remain many patients who are not to be cured and they continue with their cathartic drugs from time to time and to them you can offer some variety from the list I have presented. Let it be added, too, that usually each patient has discovered the purgative best suited to his needs.

NEURO-PSYCHIATRIC COMPLICATIONS IN DISEASES OF THE BLOOD*

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ENOUGH is known perhaps to justify the general view that the energy exhibited by the nervous system is derived, in the long run, from a metabolism of material in the nerve-cells, a metabolism which consists essentially in the splitting and oxidation of the complex substances in the protoplasm of the nerve-cell itself.

Two important pathologic syndromes are recognized in nerve-cells, namely, the syndrome of primary degeneration and the syndrome of secondary or wallerian degeneration. In the former, the microscopic changes in the cells are due to some injurious influences exerted directly and primarily upon the nerve-cells themselves. These changes are produced by toxins or unfavorable physical conditions. They may be occasioned by certain inorganic substances, by microorganisms, by inanition, by anæmia, or by hyperæmia. Or, the determining causes may be physical such as exposure to extremes of heat and cold. The most noticeable change in the nerve-cells, as a result of these unfavorable influences, is chromatolysis of the so-called Nissl bodies, which is followed by an œdema of the cytoplasm with disappearance of the cell nucleus, and eventually by a disintegration of the neurofibrillar network. When the neuron reaches this stage, the pericellular neuroglial cells undergo rapid proliferation and almost completely surround the diseased nerve-cells. If the injurious influence is removed or for some reason or other ceases spontaneously, regeneration occurs, but in the reverse order. Secondary degeneration is due to injury or disease not of the cell directly but of its axon. The microscopic changes are similar to those of primary degeneration, except that the chromatolysis begins in the Nissl bodies immediately around the nucleus and

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extends peripherally. When the nutrition of nerve fibres is interfered with, be it through disease, pressure or injury, the degeneration consists in a breaking up of the medullary sheaths into variously shaped droplets and a decomposition of these with the formation of fat. In many cases the axis cylinder is more or less completely destroyed. The neurilemma and its nuclei do not usually undergo degeneration, but may persist and participate in regeneration when restitution occurs. Degeneration of the nerves may also occur from disease of the special nerve centres with which these nerves communicate, or from inflammation of the nerves themselves.

These changes may, in a general way, be said to be merely expressions of reaction of the nervous system to exogenous and endogenous toxins, to primary circulatory disturbances within the nervous tissues themselves as well as to secondary circulatory disturbances induced by pressure upon or injury to them. These changes are the basis of the pathogenesis of the symptomatology of almost all diseases of the nervous system. The different clinical pictures and syndromes encountered in clinical neurology are expressions of these same phenomena in different anatomic localizations, which, as a matter of clinical experience or as a result of animal experimentation, have been found to be peculiarly influenced by the fact that some poisons have a special predilection for some special elements of the nervous system.

It is well known that for the normal functioning of the nervous elements an abundant supply of oxygen and a timely removal of carbon dioxide and the products of metabolism are of the greatest importance. The effect of anoxæmia (oxygen want) on the activity of the nervous system is best illustrated in cases of acute anoxæmia. In this condition one encounters memory defects, poor attention and lack of judgement associated with marked emotional disturbances. There also occur muscular twitchings, weakness, tremors and ataxia with paræsthesias and sensory impairment. Visual and auditory acuity are diminished. These symptoms are transitory, and if the anoxæmia is of short duration there result no permanent defects of function. The studies of the U. S. Air Service in aviation well show how these conditions are produced, and the best methods of preventing and alleviating them in flying. The effects of anoxæmia are also

seen in the convulsions of the asphyxial states, and in the epileptiform seizures at the onset of a cortical thrombosis or in the convulsive states which accompany free hæmorrhage from any part of the body.

Irritative phenomena of cerebral compression in intracranial hæmorrhage are associated with cyanosis, *i. e.*, a deficient supply of oxygen to the brain. When compression produces cerebral anæmia, irritative symptoms give place to paralytic phenomena. According to Walshe,¹ jacksonian seizures in patients with depressed fractures of the skull over the motor cortex depend on the compression of the cortex and interference with its circulation, and not on the irritation of these areas by spicula of indriven bone. Walshe¹ believes that the discharges from a hyperexcitable centre are not only exaggerated, but that they are also altered qualitatively. He doubts whether irritative phenomena ever occur apart from impairment of functional efficiency.

An insufficient supply of blood and oxygen bring about at first an increased irritability of the nerves (Kussmaul-Tenner experiment—after ligation of the carotids, cerebral spasms, loss of consciousness, etc.), but if the insufficiency of the oxygen is increased the nervous irritability is lowered. It is also known that certain centres in the medulla oblongata are stimulated by blood poor in oxygen. It is for this reason that there occurs in cerebral anæmia nervous irritation associated with exhaustion. In addition there also appear various disturbances in the distribution of the sensory nerves whose nuclear origin is in the medulla.

In cerebral hyperæmia, so-called “congestive hyperæmia” must be differentiated from passive hyperæmia. The latter is due to general congestion from cardiac or pulmonary disease, from sinus thrombosis and from neoplasms compressing the large veins of Galen, and which are usually associated with internal hydrocephalus. In cases of venous congestion the arterial flow to the brain is obstructed on account of the latter’s more or less unyielding enclosure. The consequences of passive cerebral hyperæmia are, therefore, similar to those of cerebral anæmia, except that the patients do not look pale, but are cyanotic and have unusually prominent veins in the neck. That the success of treatment in these

two conditions will depend largely upon the correct interpretation of these varying phenomena is self-evident.

In this connection we also wish to point out that Haliburton was able to show experimentally that the pressure of the cerebrospinal fluid and its rate of flow may be increased independently, by the secondary effect of altering the blood-pressure, by an excess of carbon dioxide, or by a lack of oxygen in the blood, as in asphyxia. Carbon dioxide is one of the most potent means of promoting the flow of cerebrospinal fluid. The significance of this in the pathogenesis of some cerebral conditions is quite obvious.

When a nerve-trunk has been deprived of its oxygen containing nutrition, a neuritis may develop. Thus a peripheral neuritis may be traced to injury of the axillary, brachial femoral or popliteal arteries. Its symptoms are: Paralysis, peripheral in type, with reaction of degeneration, anæsthesia, analgesia, pain, and vasomotor disturbances in the distribution of the nerve-trunk involved. Single large or small but repeated hæmorrhages, from whatever cause, occasionally give rise to visual disturbances which may be accompanied by an optic neuritis, or definite blindness with optic atrophy. The last complication, however, is comparatively rare. Ordinarily the visual disturbances appear between the third and eighth days after the hæmorrhage—never before, nor after the third week. The visual disturbances following hæmorrhage may manifest themselves in the form of (1) hemeralopia (night-blindness), (2) homonymous hemianopsia of cortical origin, without changes in the fundi, and with fixed scotoma, or (3) bilateral or unilateral diminution of visual acuity, progressing rapidly to partial or total blindness, and ordinarily incurable. These disorders of vision occur most frequently after forty, and in women. The optic lesion is most often peripheral. Other cranial nerve or polyneuritic disturbances may occur at the same time. The mechanism of these phenomena is obscure. Terson² is inclined to believe that ischæmia or hypotension alone is not the cause of these manifestations, but that anaphylactic phenomena are involved. Possibly products of degeneration are absorbed from the extravasated blood and these give rise to a special neurotropic toxæmia. Necropsies have demonstrated an ascending atrophy of the optic nerve beginning peripherally with retinal

lesions and without signs of infection, inflammation, embolism or thrombosis. This is of interest in connection with a recent paper by V. R. Mason³ on optic neuritis and serum sickness. The treatment in these cases is to be directed against the ischæmia and toward the production of moderate congestion. Stimulation and transfusions are therefore indicated.

We have, thus far, we believe, given sufficient evidence of the significance of the oxygen and carbon dioxide contents of the blood in the production of nervous symptoms encountered in practice. The production of nervous symptoms by circulatory disturbances from direct mechanical causes is not within the scope of this contribution, and we, therefore, pass on to the effects on the nervous system induced by diseases of the blood itself.

Cerebral hæmorrhage in the new-born is an interesting problem for the obstetrician, pædiatrist, and surgeon as well as the neurologist. Post-mortem examinations in the New Born Clinic at the University of Minnesota revealed cerebral hæmorrhage in more than 50 per cent. of all infants that died intrapartum or during the first days of life. It was noted that this was the case following non-instrumental and easy delivery. It was especially frequent following breech presentations and premature births. Asphyxia neonatorum to which Little, McNutt, Cushing and others had attributed the cerebral hæmorrhage, was not always a factor in these cases.

While there is no doubt that massive hæmorrhages in the still-born or in infants that die in the first hours of life are probably due to rupture of large veins, sinuses or to tentorial lacerations, there remain a large number of cases in which cerebral hæmorrhage develops insidiously and not until several days after birth, giving rise to symptoms of increased intracranial pressure, convulsions and death. In these cases necropsy reveals a large blood-clot with a thick centre and thin edges, usually unilateral and covering the parietal area of the brain. There is no demonstrable source of hæmorrhage, but further examination shows multiple bleedings in parts of the body in which it is difficult to conceive of trauma during normal birth, or from the effects of obstetric procedures. These findings led to the conclusion that the obstetrician was perhaps being blamed unjustly. Green⁴ was the first to suggest that the possible

cause of these hæmorrhages was some disturbance in the coagulating properties of the blood. This suggestion was later taken up and investigated by Rodda,⁵ whose conclusions are as follows: (1) Cerebral hæmorrhage may follow normal labor, when least expected. (2) A more frequent cause of cerebral hæmorrhage, with all its cardinal symptoms of bulging fontanelle, cardio-respiratory disturbances, spasticities and convulsions, is mild trauma plus hæmorrhagic disease of the new-born accompanied by delayed coagulation time and prolonged bleeding time. This hæmorrhagic tendency may remain latent until an abrasion of the skin, opening of a hæmatoma, forcible removal of the umbilical cord or circumcision gives occasion for protracted bleeding. Likewise, the rupture or tear of some small vein over the cerebral surface may supply the impulse for the hæmorrhage, if the hæmorrhagic tendency be present. Rodda found that in these hæmorrhagic conditions the bleeding point was often occluded by a small clot, and that the movement of a limb or contact with the bed clothes often displaced the clot and precipitated a fresh hæmorrhage. A clot of this kind could easily be displaced by the infant's crying or vomiting. This explains the protracted and late bleedings in many of these cases.

The average coagulation time of the blood in the new-born (Rodda) is seven minutes, with a normal range of from five to nine minutes. The average bleeding time (Duke's method) is three and a half minutes, with a normal range of from two to five minutes. There is a prolongation of the coagulation and bleeding times from the first to the maximum on the fifth day of life, with a return to the average first day determination time before the tenth day. This coincides precisely with the age of incidence of hæmorrhagic disease in its relation to cerebral hæmorrhage. Delayed coagulation times were favorably affected by subcutaneous injections of whole blood; the latter is, therefore, now regularly employed in these cases with quite satisfactory results.

In the more severe cases and in those not relieved by whole blood injections, the question of localizing the hæmorrhage and performing a decompression will arise. If the skull is to be opened, the most favorable site for operation is the side opposite the arm presenting the most pronounced convulsions. The base of the cranial flap

should be about 5 cm. across, and every vessel that is to be severed must be ligated with very fine silk. If the blood is not clotted Vignes advises inserting a drain for a day, and puncturing the ventricle if hæmorrhage into it is suspected. If the brain is bulging without hæmorrhage, bilateral trephining will relieve the pressure. In subtentorial injuries the infant is usually quiet, cyanotic and presents nystagmus. As the blood flows down the spinal subarachnoid space, there results stiffness of the neck and diffuse rigidity. Lumbar puncture in these cases always shows blood, and there is no bulging of the fontanelle. In cases of subtentorial hæmorrhage Cushing's occipital incision is indicated. In this connection it is well to bear in mind that the new-born's brain is unusually tolerant to compression, and consequently the symptoms and signs may be slight and obscure; definite localizing symptoms may frequently be entirely absent. Of course, whatever operative procedure is resorted to, must be controlled by blood studies, and injections of whole blood are to be given, if so indicated. Foote, of Washington, and others employ thromboplastin or horse's serum or both with favorable results. Repeated lumbar puncture is of value only in subtentorial bleeding. All measures that tend to arrest bleeding and prevent the possible sequelæ of pressure on the cerebral cortex with consequent degeneration of the cortical cells are indicated.

Whether the deficiency in coagulability is due to some destructive agent in the blood or to a deficiency of certain substances concerned in coagulation, is not known. It is known, however, that congenital syphilis is not the only cause of the difficulty. The practical point that suggests itself in this connection is that blood coagulation tests be performed as a routine procedure in new-born infants. This may, perhaps, seem an unnecessary procedure, but to anyone who has occasion to observe the scarred survivors of infantile cerebral hæmorrhage—their physical and mental helplessness—it will at once appeal that anything that can be done to avoid such disaster is not to be considered useless or unnecessary.

A few cases of cerebral hæmorrhage have been observed in hæmophilia. In those reported, layers of blood were found on the surface of the dura and in the cerebral ventricles, but the cerebral substance, apart from being unusually pale, was normal (Hauck). Armand-

Dellile report a case of purpura hæmorrhagica with a segmental distribution of the purpura similar to that of herpes zoster. Pressure from a surgical dressing producing a purpuric eruption over an area supplied by certain cutaneous nerves was observed by Gougerot and Salin. The symmetrical distribution of the rash is regarded by some as an indication of some probable relationship between the nervous system and the purpura. Spinal puncture has in some of these cases shown evidence of meningeal reaction, lymphocytosis and considerable albumin.

Gordon, of Philadelphia, reports the case of a five-year-old, ill-nourished boy who suddenly began to bleed from the gums and lining membranes of the mouth. The positive clinical findings were: Weak heart-sounds, markedly diminished knee-jerks and a sub-normal temperature (97 degrees). The blood showed a diminution in the number of platelets; coagulation time was normal, but the clot remained non-contractile—circumstances distinguishing the condition from hæmophilia. In spite of transfusion with human blood and the subcutaneous injections of thromboplastin, the boy died. Necropsy performed twelve hours after death revealed an unusually pale brain; throughout the entire nervous system, except the cerebellum, the pathological process was limited exclusively to the gray matter. The lesions consisted chiefly of vacuoles situated between the cells, some of which seemed to have been disintegrated. Some blood-vessels were empty, others were filled with blood-clots; multiple hæmorrhages had evidently occurred simultaneously in many segments of the neuraxis. The vacuoles indicated absorption and disappearance of the cells destroyed by the hæmorrhages. The cervical cord showed more intense destruction than the thoracic and lumbar segments. The destruction of the cells in the gray matter was in marked contrast to the usual lesions found in the anæmias, in which the involvement is, as a rule, more marked in the nerve fibres.

Cerebral hæmorrhages in jaundice, and in other conditions in which hæmolysis is a marked feature, are usually multiple in nature and occur during the terminal stages of these diseases. The writer recently saw a case of multiple and continuing cerebral bleeding in a 53-year-old woman, in the last stages of a hypertrophic biliary cirrhosis. The patient was extremely jaundiced. Her blood Was-

sermann was negative. Blood-pressure, 160/75; red blood-cells, 3,400,000; white blood-cells, 7000; Hb., 55 per cent. Urine, 1.012; albumin, 2 plus; numerous hyaline and granular casts; few erythrocytes. There were also multiple hæmorrhages throughout the body including the mucous membranes. The diagnosis of multiple cerebral hæmorrhages was made from the sudden onset of symptoms of cerebral bleeding and the multiplicity of lesions indicating cortical, subcortical, striatal and cranial nerve involvement, scattered diffusely and over various cerebral centres. No necropsy was obtained.

A so-called myelopathic form of purpura is occasionally seen in spinal diseases, especially in transverse myelitis. The bleeding may be associated with trophic disturbances, erythema and localized sweating. It occurs also in rare instances in tabes during the attacks of lightning pains, and in the distribution of the nerves along which the pains occur. The purpuric rash may then be associated with herpes, œdema and local sweating. A symptomatic purpura may be seen in the distribution of the affected nerve in severe neuralgia, and in peripheral neuritis due to alcoholism, toxic, septic, infectious and scorbutic conditions. During the war an unusually large number of cases of purpura were observed by Netter in meningococcus infections, 29.7 per cent. in a series of 173 cases.

Of special interest was recently a woman of 49 in the wards of the Beth Moses Hospital, who during an attack of peliosis rheumatica developed a bilateral optic neuritis. There were no hæmorrhages in the disk. There were no other evidences of organic nerve involvement. The patient's blood also gave a 4 plus Wassermann reaction. How much of the optic neuritis was due to the blood disease and how much to the syphilis, is problematical. At any rate we never saw in lues such optic neuritis, without other evidences of syphilitic nerve involvement. As the purpuric condition was improving the optic neuritis also began to show evidences of recession. At no time were there any visual disturbances.

Vasomotor nervous disturbances in the course of purpura are well known to clinicians, and have been described as early as 1875 by Vulpian and 1883 by Schwimmer.

The nervous symptoms encountered in chlorosis are: A neurasthenic disposition, lassitude, torpor, irritability, insomnia, head-

ache, neuralgic pains in various parts of the body, especially the face, frontal and parietal parts of the skull, vertigo on exertion and vasomotor symptoms. Gastralgia and pain under the left breast are very common, as are what is usually spoken of as "referred pains," *i. e.*, in certain cases, headache and neuralgia represent a pain referred from some organ in the head such as the eyes or teeth.

An important complication of chlorosis is thrombosis. Although it most commonly occurs in the legs, it may occur in the cerebral arteries and sinuses and by producing sudden hæmiplegia, becomes of neurological interest. The greatly increased number of blood-platelets in some of these cases is said to be an important contributing factor in the formation of the thrombi.

Thrombosis may occur in the so-called simple anæmias secondary to debilitating diseases, such as, phthisis, nephritis, hyperthyroidism, hypothyroidism, carcinomatosis, hepatic cirrhosis, chronic focal sepsis, poisoning with various drugs, senility, and lactation—and this, without cardiovascular or renal disease. Transient paralyses are sometimes observed in the anæmias following obstinate diarrhœa, or after the use of drastic cathartics or by irritation from worms, or following severe losses of blood. Oppenheim designates this condition as a "paralysis from exhaustion due to anæmia." The anæmia of hookworm disease is accompanied by psychic disturbances which are characteristic of the disease: Mental indolence, lassitude, and apathy. The anæmia of pellagra is also associated with mental dullness, hebetude, lack of initiative, memory defects (confabulation) and polyneuritis-symptoms resembling those observed in the Korsakoff syndrome.

White spots in the retina, similar to those observed in the nephroses, are common in all the anæmias (Horniker). Optic neuritis and neuro-retinitis are occasionally observed. The nature of this association is as yet not understood. Sometimes the neuritis appears suddenly and may progress as rapidly as in cases of intracranial neoplasm. The prognosis of the ocular changes in the anæmias is quite favorable. Most of them improve after the judicious administration of iron, and this, Gowers believes, is evidence that they are not due to cerebral thrombosis.

In chlorosis a knee-jerk is occasionally found to disappear as a result of peripheral neuritis, but this is probably found in complicated cases. Neuritis and polyneuritis in the course of the malarias are attributed by many writers to the anæmia which accompanies them. Characteristic of malarial trifacial neuralgia is the involvement of the ophthalmic branch of the fifth nerve. Neuritis may also occur in the nerves of the arms and legs. Encephalitis due to malaria has been observed. Marinesco recently reported a fatal case of encephalitis in which the plasmodia were found in the cerebral vessels. Sabatucci saw during the War two cases of paraplegia in soldiers afflicted with malaria. After a period of weakness in the limbs, followed by intermittent claudication and rectovesical sphincteric disturbance, there developed a spinal cord apoplexy giving rise to paraplegia, retention of urine and fæces and bed sores. The prognosis in these cases is not very good. Quinine helps only to ward off the febrile attacks which usually aggravate the nervous disturbances.

Neuro-psychiatric complications occur in from 75 to 80 per cent. of the cases of pernicious anæmia. It is important to note that the nervous and mental symptoms may appear long before—even years before—there is definite evidence of the anæmia. It is not at all uncommon if one is in the habit of making routine neurological examinations to find cord symptoms very early in the disease, especially in patients advanced in age; they are almost always present in individuals over 55; they are less common in younger patients.

Woltman, of Rochester, Minn., found in 150 cases of pernicious anæmia indisputable evidence of destruction of nerve parenchyma in 80.6 per cent., while 12.7 per cent. sought medical advice purely on account of the nervous symptoms. Nerve symptoms may be the principal feature in the clinical picture and the blood may never go to a very low level. The absence of signs of severe anæmia does not necessarily indicate that death is not far off. Many patients have fatal cord involvement with a hæmoglobin content of over 75 per cent., and 3,000,000 red cells.

It is much more common to have comparatively slight nerve symptoms, such as slight disorders of sensation, numbness and tingling of the hands and feet, than typical symptoms of combined

sclerosis of the cord. Cases with paræsthesia may show no definite cord changes at necropsy. Other anæmias may also be associated with paræsthesias, but these are not so persistent, and only in evidence when the anæmia is very severe, which is not the case in pernicious anæmia.

There may also occur slight disorders of motility; these are generally due to the lesions within the cord, although in some instances they are due to the general weakness of the anæmia. The motor disorders may be spastic or ataxic in nature or both. Involvement of the lateral columns of the cord gives rise to symptoms and signs of pyramidal tract disturbances: Spastic gait, increased deep and tendon reflexes, positive Babinski sign and its confirmatories, ankle or patellar clonus and signs of paralysis. Involvement of the posterior columns gives rise to symptoms and signs of tabes: Ataxia, lightning-like pains, girdle sensation, abdominal crises, absent or diminished deep and tendon reflexes, sphincteric disturbances, loss of the vibratory sense, loss of the sense of position and posture.

Loss of vibratory sense may be the first symptom of pernicious anæmia. It may be lost without the loss of passive joint movement and *vice versa*. This is probably due to the fact that the long sensory fibres of the cord, which are chiefly affected, carrying these two forms of sensibility pass up the cord sufficiently separated, so that a beginning lesion in the posterior column may involve either one or the other alone, at an early stage of the disease, or, as Petren claims, it may be that the fibres subserving joint sensibility, at least, may pass up the cord in two pathways.

The symptomatology of the nervous complications will, therefore, vary according to the location of the lesion and according to the time that each system is involved. When both the lateral and posterior columns are involved at the same time we obtain the classical picture of combined sclerosis. It stands to reason that many transitional forms may occur, and this is actually the case. Foci of sclerosis may be found in various parts of the cord, giving rise to various incomplete clinical pictures of spinal cord disease, rather than to a clear-cut ataxic or spastic or combined system disease. A diffuse myelitis is rare, and sharply located sensory symptoms (level lesions), except for the paræsthesias and anæsthesias, are unusual.

Rarely hæmorrhages into the central canal may give rise to unusual sensory disturbances (dissociation). Pain is rare, but when present may be very intense, especially on moving the extremities. In some cases there also occurs degeneration of the peripheral nerves, with the classical symptoms and signs of neuritis. When multiple, the sensory disturbances are of the "glove and stocking" variety, involving touch, pain, heat and cold. Five per cent. of Woltman's cases showed in addition to spinal cord lesions evidences of multiple neuritis.

There is no clinical condition known in which the subjective sensory disturbances, the paræsthesias in the hands, legs and feet, and the cramps in the calves are as distressing as in pernicious anæmia. They are constant, they progress steadily and the patients are unable to describe them in definite terms.

Although, as we stated before, the spinal cord symptoms may precede (especially in individuals over 55) the anæmia by years, nevertheless it is rather unusual to have a marked typical combined sclerosis before any very definite anæmia. Although this may be the case, it is much more common to have the anæmia precede the sclerosis, usually by about ten months; occasionally, however, both may begin simultaneously. As a rule the nerve symptoms develop rather slowly; but there are also exceptions to this rule. There is a distinct lack of parallelism between the severity of the blood changes and those of the nervous phenomena.

While remissions may be said to be characteristic of pernicious anæmia, the degree of spinal cord degeneration is not an index as to whether remissions are likely to occur or not. When definite cord degeneration is once present, it will always remain, even though there occurs a remission in the other symptoms. The cord symptoms too may, during a remission, improve slightly, but no *marked* improvement will occur. The paræsthesias, however, may be diminished or may temporarily disappear with improvement of the blood-picture. When pain on motion is present, it is apt to diminish as time goes on, whether the blood improves or not.

Spinal puncture, as a rule, yields a negative fluid, which, in the presence of well-established symptoms of combined cord degeneration, points to a toxic degenerative process in the cord rather than to an

inflammatory lesion. In some cases psychic disturbances precede the anæmia, this, however, is not the rule. Their onset is usually regarded as indicating that no remissions in the anæmia are likely to occur. The most common psychic symptoms originally described were somnolence and apathy preceding death. Later it was found that these mental symptoms are not merely terminal affairs, but that in a great majority of cases they constitute the dominating feature in the clinical picture of the disease. The mental symptoms may range from a mild depression to violent maniacal outbursts. There may be loss of orientation as to place, time and person, with lack of insight. Some patients show irritability, hyperkinetic phenomena, euphoria, delusions of persecution, hallucinations, disordered attention and poor perception. When delusions are present, they are usually vague, unsystematized and loosely connected. The writer has seen two cases with marked memory defect and confabulation not unlike that observed in the Korsakoff syndrome. Some patients are indifferent, dull and apathetic. When, however, a true psychosis, such as manic-depressive insanity, occurs, it is usually considered a distinct clinical entity in the production of which the anæmia is merely a predisposing factor. The psychotic manifestations of pernicious anæmia, *per se*, are classified among the exhaustion and infective psychoses; they are best included among the paranoid states which are symptomatic of toxic organic processes affecting the central nervous system analogous to those seen in tabes, alcoholism and drug addiction. Barret and Woltman in their recent anatomic investigations find that the brain and cord changes run fairly parallel and with the same frequency; and furthermore, that individuals who showed at necropsy degenerative changes in the cord, usually showed the same type of a lesion in the brain. The latter may be more intense than the former, especially when the disease has lasted for a long time. This is believed to be due to the fact that in addition to the toxic effect of the poison on the pyramidal cells, there also occur metabolic changes in the nerve-cells as the direct sequel of the long standing anæmia.

Mental symptoms have also been reported in cases of pernicious anæmia in patients with arteriosclerosis. In these it seems almost impossible to determine which of the symptoms were due to the

anæmia and which to the arteriosclerosis. The occurrence of remissions would seem to be in favor of the anæmia as the pathogenetic factor of the mental symptoms.

As a result of changes in the cerebral cortex, convulsions and transient hemi- and monoplegias are sometimes observed. Disturbances of the special senses depending on changes in the central nervous system are not very common; those most frequently encountered are: Dimness of vision, which if present occurs very early; optic neuritis, optic atrophy and hæmorrhages associated with retinitis are occasionally seen. Hæmorrhages may also occur in the ears, but these as well as the retinal hæmorrhages are late symptoms and are attributed to the anæmia. Woltman reports cases with disturbances of smell and taste. The writer had occasion to observe a case in which the first symptoms of the disease were hallucinations of smell.

The blood-picture, symptoms other than those of the nervous system and the pathogenesis of pernicious anæmia are not within the scope of this paper. We will however invite attention to a brief resumé of the theory of the pathogenesis of this form of anæmia, as recently announced by Lurie, because some of its features seem to have a direct bearing on its neuropsychiatric complications. (1) One toxin is at the basis of the changes in the blood and central nervous system. (2) This toxin acts independently on the blood and central nervous system. This would account for those cases (*a*) in which the nervous symptoms manifest themselves before the anæmia, (*b*) where the anæmia precedes the cerebral and cord changes, and (*c*) where both conditions occur simultaneously. (3) As soon as the typical blood-picture develops and persists for a considerable length of time, the metabolism of the nerve-cells is so impaired that changes which are purely functional at first and due to the irritating effects of the toxin alone, now become organic and permanent. Therefore, no matter how greatly the physical condition may be improved, be it through splenectomy, transfusions, drugs (neosalvarsan), or spontaneously, there is no improvement on the part of the nervous system; the injury is beyond repair. If, however, the hæmolysis has not been of very long duration, improvement of the nervous symptoms may be expected, provided proper therapeutic procedures are

promptly resorted to. On the basis of this theory one can also explain the cases, which, *intra vitam*, present clinical evidences of nerve involvement, but at necropsy show no lesions either in the cord or brain. In these cases the irritating effect of the toxin is apparently not increased by the anæmia.

Changes in the nervous system resembling those of pernicious anæmia occur also in anæmias which are not strictly of the Addison-Biermer type. They may occur in the anæmias of leucæmia, septicæmia, bacterial endocarditis, malaria, cancer, tuberculosis, plumbism, Addison's disease, pellagra, paresis, etc.

In the leucæmias there have been found multiple hæmorrhages, focal degenerations and leucæmic infiltrations of the gray matter (Oppenheim). The mental depression observed at the termination of these diseases is not sufficiently frequent to regard it a special feature. Besides the symptoms of cerebral hæmorrhage, certain cranial nerve palsies, most commonly of the facial and acoustic nerves, due to hæmorrhagic or leucocytic infiltrations into their sheaths, have been reported. Sudden deafness following hæmorrhage into the internal ear may occur. Subjective aural sensations, such as giddiness and tinnitus, have also been observed. Parkes Weber collected nine cases of leucæmia with a definite Menière's syndrome; most of them were found to have hæmorrhages into the internal ear.

Multiple hæmorrhages are more frequent in the brain than in the cord. Small foci of leucæmic infiltration in the cord and brain substance are associated with hæmorrhage and necrosis. Epidural and dural infiltrations sufficiently large to produce cerebral or cord compression are quite common. True lymphomata of the brain and cord are rare. Cerebral hæmorrhage and leucæmic infiltrations of the nervous system are mostly encountered in myelogenous leucæmia. The nervous symptoms depend largely on the size and location of the hæmorrhage or infiltration. Funicular myelitis similar so that of pernicious anæmia may also occur. Leucæmic infiltration of the ganglia of the sensory nerve-roots, giving rise to herpes zoster, and leucæmic infiltration of the leptomeninges, are among the rarer complications. Barker reports a case of myeloid leucæmia with diminished knee reflexes, but without definite neuralgic symptoms.

The spinal fluid showed 267 myelocytes to the cubic millimetre. Foci of dense infiltration with lymphocytes may occur in the meninges along the nerve-roots, in the cord itself and in the vertebræ giving signs and symptoms of a transverse myelitis, which must be differentiated from meningitis, Pott's disease and spinal cord tumor. Priapism may be an early and persisting symptom; it is probably due to involvement of the erection mechanism in the cord. Harris⁶ describes a symmetrical polyneuritis as an early symptom in a case of chronic leucæmia; it was present before the blood-picture of leucæmia became positive.

Bass⁷ reports six cases of leucæmia in children with marked nervous symptoms. Four of the children presented the clinical picture of cerebral hæmorrhage, one proven by necropsy, and two by lumbar puncture. In one, "large brick-red masses" varying in size, some of them as large as a cherry, were found scattered throughout the cerebrum; these masses proved to be deposits of leucæmic tissue. This patient died in coma, and showed no cerebral symptoms until a few days before death. Another infant died in coma with fever and convulsions which had existed for two days. There were numerous petechiæ scattered all over the body. The case was considered as a probable instance of leucæmic infiltration of the meninges.

Chloroma, which is now regarded a biologic variation of the leucæmias, is frequently associated with symptoms due to pressure of the tumor masses on the nerves and cord. Exophthalmos and deafness as well as various paralyses that one encounters in this condition are also of neurologic interest.

Ocular symptoms in the leucæmias and in chloroma are quite common. Leucæmic retinitis may be due to hæmorrhage or to minute leucæmic deposits. The margins of the optic papilla may appear hazy, the papilla itself being covered with narrow hæmorrhagic strips. Ophthalmoscopically some of the hæmorrhages appear in front of the retina itself; the vessels, especially the veins, appear separated from the nerve-head; between the hæmorrhages and papilla, the retina may be quite normal. In some rare cases, owing to compression of the optic nerve, a true optic neuritis may occur. Hæmorrhages may also occur in the vitreus. Leucæmic infiltrations

or hæmorrhages into the nuclei of the ocular nerves or into the nerves themselves may give rise to various external ophthalmoplegias.

The nervous symptoms encountered in Hodgkin's disease are the incontrollable itching which is generalized and may be associated with a papular rash. We have recently seen a patient who was suffering from this most annoying complication for one year, during which several dermatologists saw her and treated her with various dermatologic diagnoses in mind, but without success. She was finally referred to us with the diagnosis of a "skin neurosis." A careful physical examination revealed that the patient was suffering from pseudoleucæmia. Later in the course of Hodgkin's disease there appear neuralgias in various distributions; these are due to pressure of the glands upon deep or superficial nerve-trunks and on other nerve structures and their coverings. Unilateral mydriasis with flushing or sweating of one cheek, from pressure on the cervical sympathetic, and deafness due to nasopharyngeal involvement, are not infrequent. The writer has seen two cases of Hodgkin's disease with complete paraplegia, a sensory level and sphincteric disturbances due to lymphoma in the epidural space with compression of the cord.

It is strange that while the nervous complications of the anæmias have been studied and reported upon quite extensively, those of the polycythæmias have received very little attention. The nervous manifestations most commonly seen in the polycythæmias are: Pains, headache, dizziness, visual disturbances, motor and sensory disorders, muscular twitchings, choreiform movements, convulsions, speech disturbances, mental, vasomotor and trophic disorders.

The pains may be general or local. When general, the patients complain of a vague aching sensation and feeling of fulness over the entire body, but most marked in the head. Many of the patients complain of various neuralgic pains, especially in the small of the back and radiating to the legs. The pains may be continuous or they may appear in paroxysms. Epigastric pain which bears no relation to the ingestion of food is very common. Cases have been reported in which the pain was not unlike that of intermittent claudication in the region of the heart, in the intestines and in the extremities (Lankhout). The headaches in polycythæmia are characterized by the fact that they are increased by changes of

position which interfere with the intracranial circulation. The pains are generally relieved by rest, derivatives and venesection; they are aggravated by mental and physical exertion. The pains in the extremities may be associated with spasms in the muscles and swelling of the large joints, as in infectious arthritis, and may be severe enough to keep the patients awake at night.

Visual disturbances appear early and quite frequently. Some patients complain of easily induced fatigue from the use of the eyes, blurred vision and diplopia; the latter is due to the associated palsies of the external ocular muscles. Scintillating scotomata, transient blindness and hemianopsia are not infrequent. There occurs in this disease a form of asthenopia without error of refraction, in which the patients give a history of repeated but unsuccessful efforts to obtain proper adjustment of eye-glasses. The ophthalmoscope reveals changes which may be said to be characteristic of the disease: The veins are distended and engorged so that they appear much larger and darker than the arteries; they are tortuous and may show knob-like varicosities. The disk may be normal, slightly congested, or it may have the appearance of a mild optic neuritis.

Paralyses and pareses, transient and recurring or permanent, are very common. There may be hemi- or monoplegia with or without cranial nerve involvement. The motor symptoms may be accompanied with sensory disturbances, or sensory symptoms may exist without motor symptoms. Subjectively the patients complain of paræsthesias and pains as we described above. It is peculiar that in spite of the fact that on palpating the skin, it generally feels warmer than normally and the temperature appears somewhat elevated, the patients experience a sensation of chilliness. The motor and sensory phenomena may be sufficiently focal to suggest the possibility of cerebral compression. Christian⁸ reports a case which had been seen by neurologists and ophthalmologists and the diagnosis of cerebral tumor was seriously entertained. No one seemed to have suspected the polycythæmia until the patient was admitted to the hospital, and even then, Christian states, it was still thought possible that some of the focal symptoms were due to a central neoplasm.

Depending on the location of the pathologic process, one may meet with various hyperkinetic phenomena, such as twitchings,

choreiform and myoclonic movements, local or general spasms and convulsions with or without loss of consciousness. Fainting spells are common. There are cases reported in which the patients had staggering gaits, with other symptoms suggestive of cerebellar involvement. Roaring, ringing and buzzing in the ears with other symptoms of acoustic nerve involvement are not uncommon. Transitory or permanent speech defects varying from mere indistinctness of speech to complete aphasia may also occur.

Some patients exhibit memory defects and general symptoms of what is usually designated as "neurasthenia" or "psychasthenia." They are emotionally unstable and have a tendency to become easily depressed or excited and at times even delirious. Insomnia is a common symptom.

In the vasomotor sphere hyperhidrosis is the most common symptom. Excessive incontrollable salivation with nausea after swallowing the saliva followed by anorexia were the chief symptoms that compelled one of our patients to seek medical advice. Trophic disturbances are manifested by excessive dryness of the skin, in spite of the hyperhidrosis; in some cases the skin becomes pigmented and may be violet or almost black or slate-gray in color. Although Osler has pointed out that in this condition the patients have a peculiar color which he describes as "red cyanotic," nevertheless all patients do not appear plethoric or cyanotic. As a matter of fact some may show unusual pallor of both the skin and the mucous membranes.

The nerve symptoms in the anæmias are usually due to neuronc degeneration brought about by toxæmia. By contrast, the pathologic basis of the nerve symptoms in polycythæmia, whether that be primary or secondary, is vascular. This may find expression in thrombotic or hæmorrhagic lesions. The increased viscosity of the blood in polycythæmia predisposes to thrombosis, which causes softening. The softening is not due to arteriosclerosis. But when the necropsy fails to reveal evidences of thrombosis or actual hæmorrhage, the most probable explanation is a circulatory disturbance, venous in character, of the entire nervous system. These circulatory disturbances are best explained by the fact that in polycythæmia, the volume of air inspired per minute tends to be increased, so that

owing to the increased blood volume there is a rise in the total quantity of oxygen in the arteries. The need for oxygen of the cellular structures of the body is not greater than normally, therefore the venous blood contains as much oxygen as normal arterial blood, and the "coefficient of utilization of oxygen" is much reduced. The volume of the blood as well as its viscosity being so much increased and the rate of flow approximately normal, the entire circulation becomes relatively sluggish. If this conception of the pathogenesis be correct, we have a simple explanation for the nervous manifestations be they central, peripheral or both. Their character and permanence depend on whether stasis only be present, or whether this has gone on to a more advanced stage, thrombosis and softening.

The following case is a good example of erythæmia (polycythæmia) with nervous symptoms: I. K., a 30-year-old Russian tailor of good family and personal history, was admitted to the Mount Sinai Hospital complaining of headache, salivation, vertigo, blurred vision, anorexia, congestion of the face and eyes, insomnia, incontrollable hæmorrhage after tonsillectomy (performed three months before admission), flushes of heat and cold, tinnitus aurium and epileptiform seizures. The positive findings were: Cyanosis, more marked in the head, upper extremities and trunk; suffusion and bulging of the eyes; divergent strabismus; intense salivation with congested gums; slight right facial weakness (central); slight emphysema; slight cardiac hypertrophy; moderate atherosclerosis; enlarged spleen; dryness of the skin of the lower extremities; hyperhidrosis of the upper part of the body; superficial and deep reflexes hyperactive; color of the blood-stream in the veins of both disks, dark purple—much darker than normal; arteries of disks normal; visual fields and vision normal.

Blood: Hb., 170 per cent. (Kuttner); 9,800,000 erythrocytes; 8000 white cells; 340,000 platelets; coagulation time 14 minutes (whole blood), normal blood about 10 minutes; tourniquet test normal (no diminution of capillary resistance, vessel wall intact); bleeding time about normal. Differential: Polynuclears, 84 per cent.; lymphocytes, 13 per cent.; mononuclears, 2 per cent.; eosinophils, 1 per cent. Blood Wassermann negative. Two days later:

Hb., 170 per cent. (Kuttner); erythrocytes, 11,456,000; white cells, 7600; platelets, 410,000. Blood-pressure, 115/65.

The patient was treated with atropin until there was intense dryness of the throat and marked mydriasis, but the salivation did not diminish, nor did local astringents applied to the gums have the slightest effect. After the withdrawal of ten ounces of blood from the median basilic vein the headache and vertigo were slightly relieved.

The urine contained a faint trace of albumin; microscopical examination, negative. Patient's blood volume showed 75 per cent. cells and 25 per cent. plasma (normally, cells about 53 per cent. and plasma, 47 per cent.); blood chemistry and basal metabolism, normal.

General symptomatic treatment gave no relief, so the patient was subjected to X-ray therapy. (Spleen and long bones were exposed to the rays.) This was followed by improvement in the blood-picture and the nervous symptoms including the salivation. At this writing the patient is still receiving X-ray treatment. His condition is so markedly improved that he has returned to work and is able to support himself and his dependents.

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THE MANAGEMENT OF A RADIOLOGICAL CLINIC

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THE fittings and apparatus of a radiological clinic do not spell efficiency to any greater degree than the furnishings of an up-to-date surgical amphitheatre imply superlative accomplishments of those in charge. Much good work, within certain limitations, may be done in either department with comparatively meagre equipment, while on the other hand much poor work can and is being turned out where the mechanical appliances are of the most elaborate and modern type.

THE COMMERCIAL X-RAY LABORATORY VERSUS THE RADIOLOGICAL CLINIC

A more intimate knowledge on the part of the general profession concerning the equipment of an establishment operated by physicians for physicians, together with a summary of what are considered their duties and obligations, may help to point out the inadequacies of an X-ray concern established on a commercial basis.

It may not be inappropriate at the start to raise an objection to the term "X-ray Laboratory." Offices of specializing physicians and departments in hospitals devoted exclusively to examination and treatment by the X-rays do not properly come within the scope of the word "laboratory," which is defined "as a place where scientific experiments and operations are carried on." Abundant wisdom, discriminating judgment and comprehensive medical learning are the foundation for successful operation of such an institution, by whatever name it may be designated. The fact that intimate relations are maintained with every other specialty as well as general medicine

would seem to suggest "Clinic" as a better name. However, much or little professional skill and attainment may be found in an X-ray clinic; the fact is, that less is to be expected in a laboratory operated by laymen and in which commercial principles prevail. Inasmuch as these concerns are encouraged, fostered and supported by the medical profession, one is brought face to face with a medical problem demanding careful analysis.

The future depends almost, if not entirely, upon those who dedicate themselves to ideals, just as the fruitful accomplishments of the past have resulted from those who have given their labors without stint or hope of adequate reward. Progress is halted, experimentation stifled, and the honor of a great profession stultified by encouraging the existence of commercial specialties, whether these be for the purpose of doing X-ray work or of any other nature in connection with diagnosis and treatment.

EQUIPMENT OF A MODERN RADIOLOGICAL CLINIC

The plan and equipment of a modern radiological clinic is a subject of no mean importance, and must be carefully considered from every standpoint if the services rendered are to be of maximum efficiency. Obviously, for both practical and economic reasons, this equipment will necessarily vary with the character and volume of the work required, and the suggestions and ideas here offered are not intended as the last word upon this subject. It is hoped, however, that they may be helpful in pointing out some of the important requirements of a clinic which is expected to render a general diagnostic and therapeutic service.

UNITS

Such a clinic should comprise three separate and distinct units: (1) Records; (2) diagnosis; (3) therapy. These three main units may with advantage be further subdivided if the volume of work justifies so doing. For instance, dental diagnosis, gastro-intestinal diagnosis, genito-urinary diagnosis, etc., are proper and logical sequences under such circumstances and may be elaborated to suit the pleasure and individual needs of each operator.

Seldom, if ever, do those who profit in the diagnostic and therapeutic benefits of a radiological clinic appreciate the prodigious

demands upon time, energy and attention to detail involved in its maintenance, and with equal certainty may it be stated that relatively few physicians or managers of hospitals appreciate the importance of an adequately established clinic operated by those who have special knowledge derived from experience or acquired from substantial sources. Not the least to be mentioned among the benefits is the development, in the fulness of time, of doctors who will be able to control, direct, and understand radiant energy in its many and ever-increasing phases.

RECORDS

The authors believe that every patient admitted to the clinic should be personally interviewed and at the conclusion of the examination a personal report should be rendered. Interrogation of the patient, fluoroscopic examination, and study of the röntgenogram should never be delegated to a non-medical subordinate.

It is an established and inflexible routine to secure, through the medium of an assistant, the name, age, sex, social status, etc., which, with the history of the case, results of examination or therapeutic technic and comments, are transferred to a card and filed for future reference. A number is placed on the röntgenogram which corresponds to the number on the card and the röntgenograms are then filed in a steel cabinet. The fire hazard from a quantity of stored films is considerable and a conflagration from such a source is minimized by the use of the steel cabinet. Before the films are filed, the corners are clipped off in order to prevent abrasion of film surfaces from the roughened holes resulting from clips on the developing racks.

Provisions for viewing a series of röntgenograms can be made at no great expense by utilizing blue nitrogen bulbs, ground glass and a tin reflector surfaced flat white. (Fig. 1.) Spring attachments with roller contacts are now supplied, making the adjustment of a film on the illuminating box a very simple and convenient process.

The filing of cases for treatment is done under general classification of diseases as "Superficial Malignancies," "Uterine Hæmorrhage," etc., and in alphabetical order.

Duplitized films are used excepting in eye localizations. The speed, convenience of filing, quality and cost have determined this

item. Double intensifying screens are likewise employed. A matter of great importance is the question of satisfactory contact between film and screen, and is a factor capable of further improvement. Doubtless future developments will solve this somewhat perplexing problem.

DIAGNOSIS

It has been found that uniformly high-grade röntgenograms can be easily obtained by a 30 ma. Coolidge tube, rectifying its own current from a suitable transformer with auto-transformer control. (Fig. 2.) This technic is used in all cases save those demanding higher gaps and prolonged exposures, as, for instance, spinal examinations, urinary tracts, and pregnancy where a rectified current seems preferable.

In common with other röntgenologists, a sense of gratitude is felt for the moving grid designed by Dr. Hollis E. Potter. Unquestionably it marks an epoch in röntgenology. It is of especial value in examinations of the spine, pelvis and urinary tract.

Chest examinations are included as a routine with all gastro-intestinal studies and are likewise made when there is any malignant disease present, the metastasis of which into the lungs might otherwise be overlooked.

Stereoscopic studies prevail excepting only in gastro-intestinal röntgenograms or when patients are returned for examination of a reduced fracture previously examined and reported.

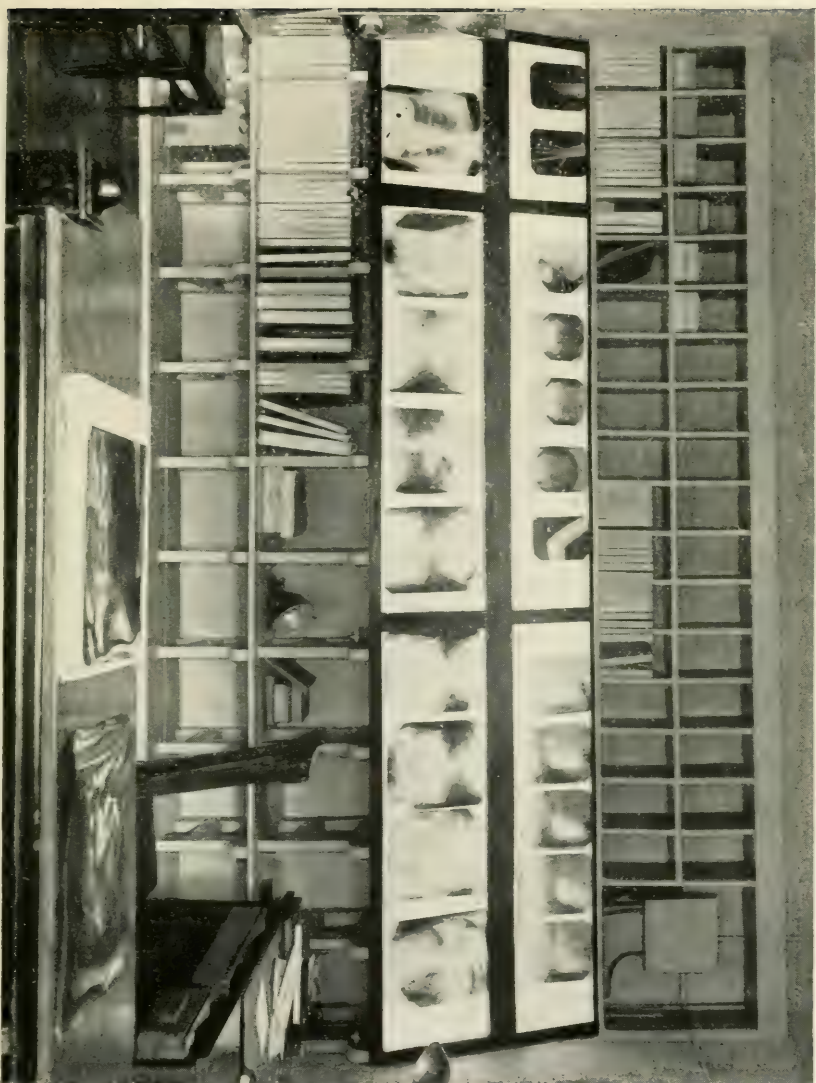
Introducing opaque substances into fistulous tracts is of inestimable value and is done when there are no apparent contraindications. It is a method of diagnosis not paralleled in medicine. The ramifications of a fistulous tract whose sometimes innocent-appearing surface aperture gives no clue to its depth or extent, renders the study of resulting röntgenograms interesting and valuable.

Pyelograms and ventriculograms are studied only after this class of subjects has been previously prepared and injected by the specialists in surgery.

Pneumo-peritoneum is rarely performed but is a procedure available for carefully selected cases, after all other diagnostic aids have failed, and when its use would justify whatever hazards are entailed.

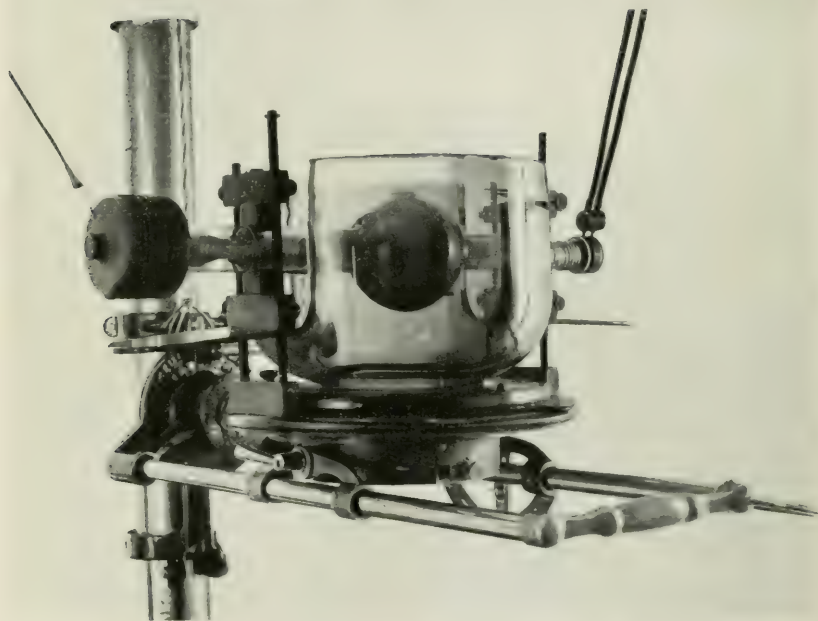
It is incumbent upon every röntgenologist to be on the alert for refinements of technic or departures from standard methods which may render X-ray studies more accurate. Very recently the sugges-

FIG. 1.



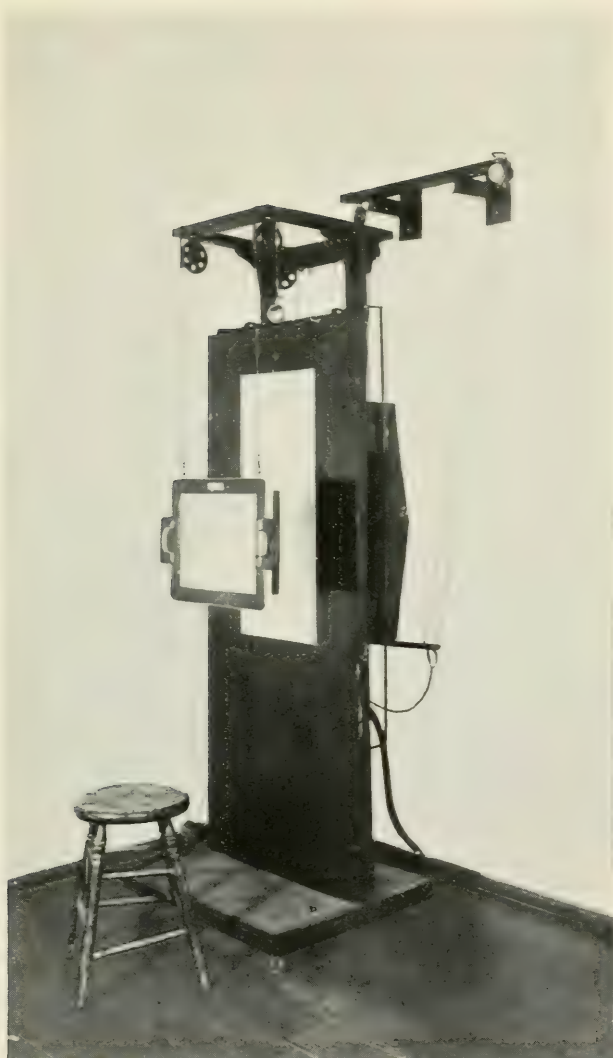
Home-made viewing rack with spaces for storing films, which has been modified by addition of steel filing cabinets to eliminate fire hazard and to provide for increased conveniences.

FIG. 2.



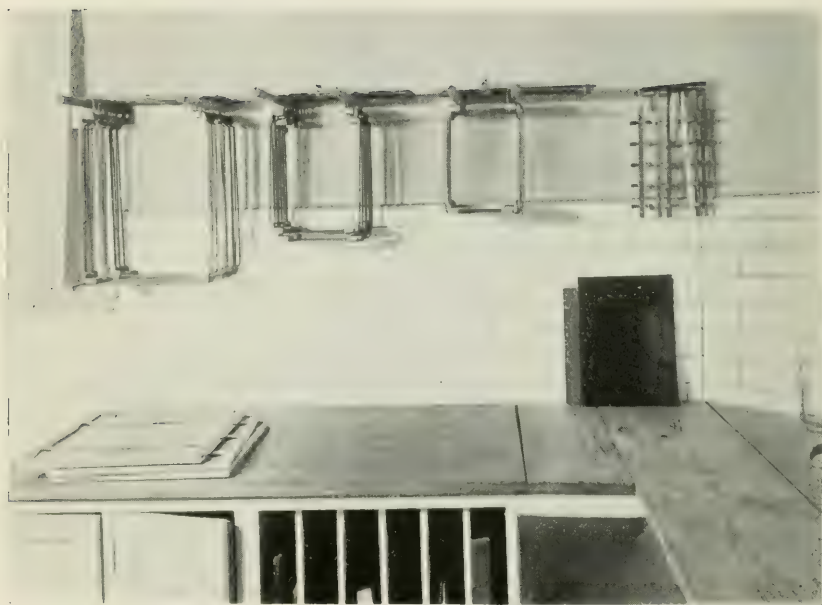
Lead glass bowl adapted for use of 30-milliamper, radiator type tube.

FIG. 3.



An old but entirely practical fluoroscope.

FIG. 4.



Corner of dark room showing work-bench and wooden pins supporting developing hangers.

tion of Alvarez concerning a method of mounting the fluoroscopic screen on the Potter-Bucky fluoroscopic grid has appreciably increased the value of fluoroscopy.¹ (Fig. 3.)

In the matter of adequate space, or rather inadequate space properly arranged, the utility of "compoboard" partitions should be kept in mind. Dressing rooms need not be spacious and when a demand for space exists a room 4 feet by 4 feet will suffice.

The problem of drying films has been exceptionally well solved by constructing a wooden box to hold one hundred 14 x 17 films on hangers. This box is closed by two lids, is open at one end, and connected to an exhaust fan at the other. It is mounted above the developing tanks in a very small dark room, and is reached by steps which lead to a 2 x 12 plank run-way along one side at the bottom of the box. This contrivance dries films quickly and conveniently and protects them from dust. (Fig. 4.)

The factors connected with development are naturally under the control of technicians, but it is good practice to call attention at no rare intervals to the necessity for increased care in this department. During the summer months the wash water and developing tanks are cooled by coils of copper pipe which are immersed in a tank filled daily with ice.

PHOTOGRAPHY

Interesting lesions and conditions are photographed as a routine. The photograph becomes a part of the patient's record. In this work a clinical camera of well-known make is used. Two 500-watt Tungsten lamps make photography a relatively simple process. (Fig. 5.) When photographing pathological specimens it has been found that objectionable shadows with detail in the background can be entirely obviated by placing the specimen on a clear glass plate elevated some inches above the floor and focusing directly downward, as can be easily done with the camera employed.

THERAPY

Whenever an X-ray treatment is given it is believed that a very definite obligation rests upon the attending röntgenologist to regulate all the factors involved. Time, distance, voltage, filters, and areas

¹ *Amer. Jour. Röntgenol. and Rad. Ther.*, 10: 1, 69, Jan., 1923.

are beyond doubt of sufficient importance to demand his personal attention and should only under exceptional circumstances be delegated to a technician.

There is no objection to and every reason for depending upon technicians of known ability for the execution of orders, explicitly given, in matters which include observation of time, metres, tube, and operation of machines. (Fig. 6.)

All metres showing tendencies toward variability should be removed and submitted to competent experts for examination. Two milliampere metres are doubtless advisable on every apparatus and should be checked occasionally against instruments of known values. Any attention to apparatus or additional proven methods which operate to maintain uniformly standard results cannot now be disregarded. Their use is mandatory and their neglect indefensible.

In the commercial world the selection of apparatus would be left to the judgment of electrical engineers and it would appear no less reasonable to consult them when purchasing equipment, the construction, accuracy, dependability and efficiency of which are items entirely apart from the domain of medicine.

When it is possible, even though the cost be considerable, the transformers and rectifying apparatus should be in a space devoted to them exclusively—useless cabinets and other barriers removed so that all parts are open and accessible. (Fig. 7.)

Ventilation is a subject to which careful attention should be given. It is impossible to state how much depends upon it, but a secure position on this question favors abundant fresh air in the treatment booths, and is secured by means of exhaust fans.

An ideal arrangement of space designed for X-ray examinations and therapy would seem to demand the elimination of noisy machinery, black-surfaced walls, and suggested or actual elements of danger.

Comfortable couches, numerous pillows, and clean linen are provided and careful attention to details, the lack of which might tend to render the patient unsafe or uncomfortable. (Fig. 8.) In cases where prolonged therapy is contemplated the preliminary use of morphine or codeine is certainly of value, particularly if the patient is apprehensive or in pain.

The authors have felt the need of a method for supporting the tube to replace the glass bowl treatment stand in common use and

FIG. 5.



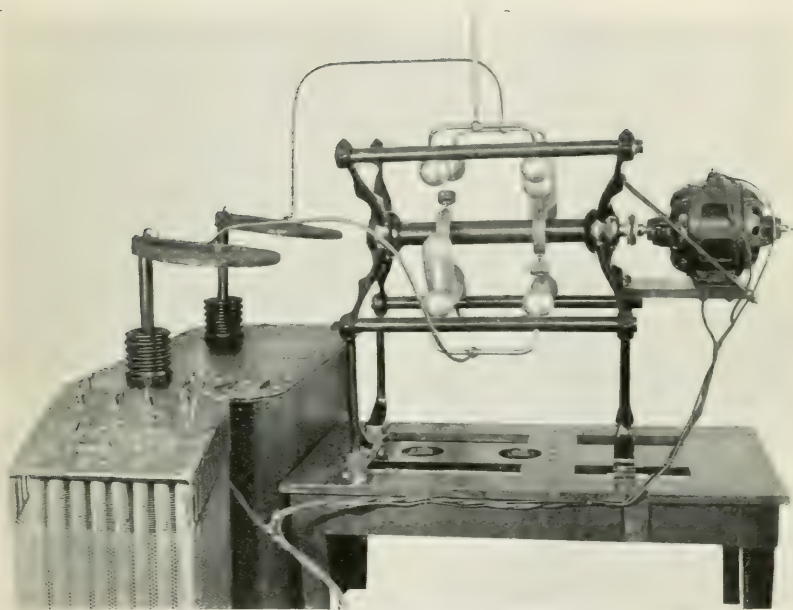
Photographic equipment.

FIG. 6.



Operator controlling two treatment units from one booth.

FIG. 7.



Efficient therapy apparatus assembled from several different units, some of which had been discarded.

FIG. 8.



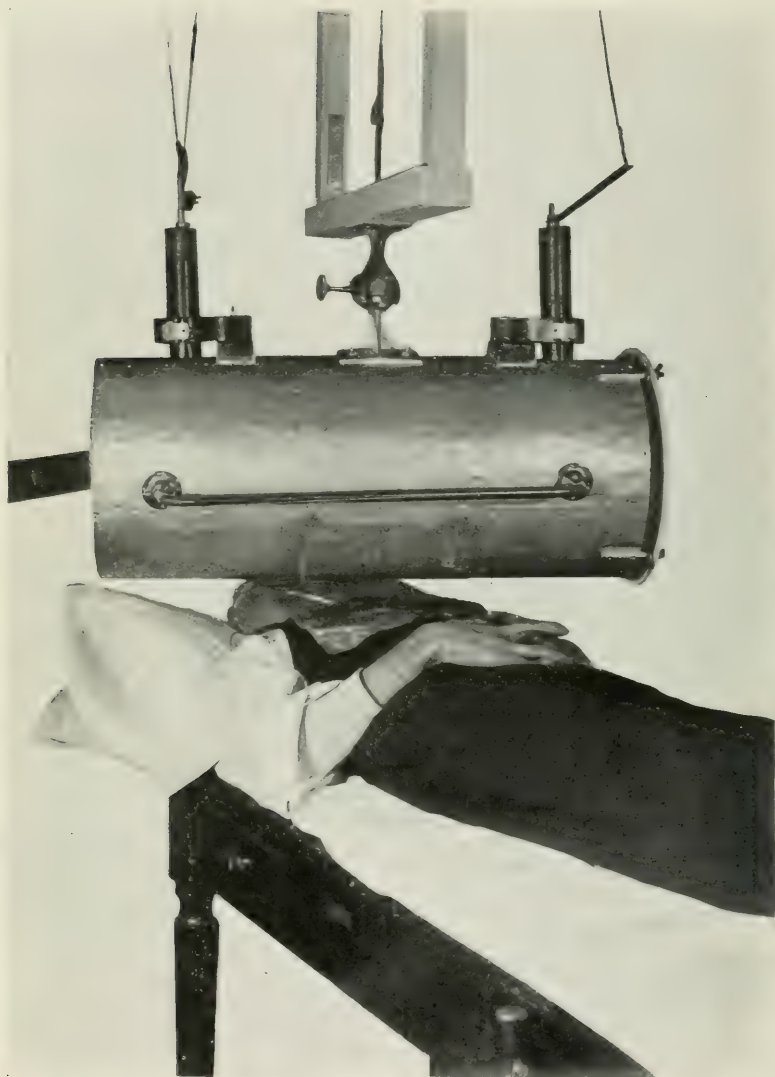
Lead cylinder enclosing Coolidge tube designed for voltages of 200,000 and upward.

FIG. 9.



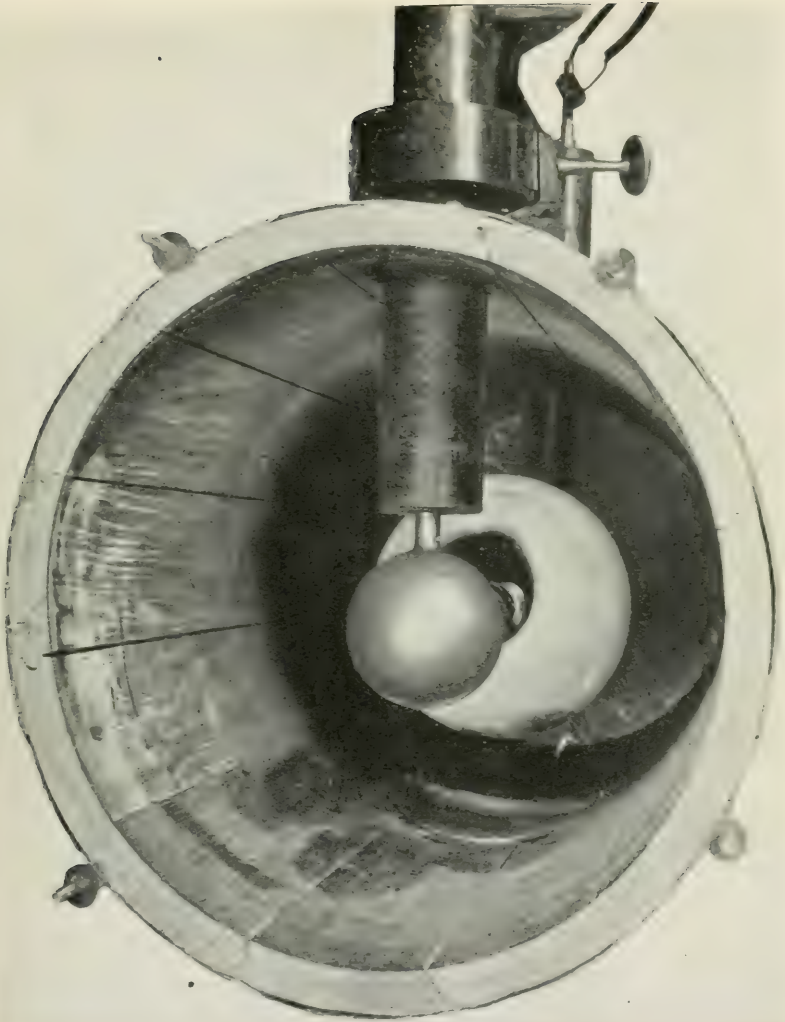
Lead cylinder, hung from the ceiling; designed by authors for voltages up to 140,000. (See also Figs. 10, 11 and 12.)

FIG. 10.



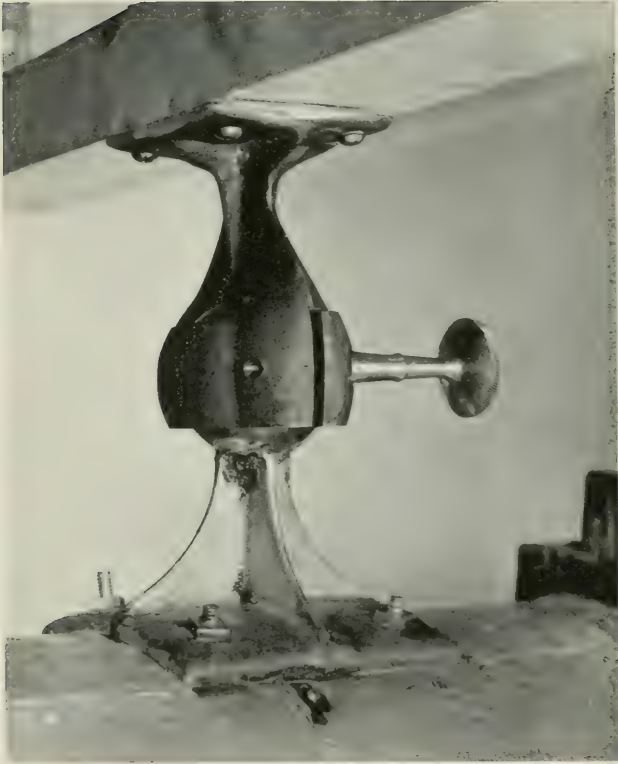
Lead cylinder in another position.

FIG. 11.



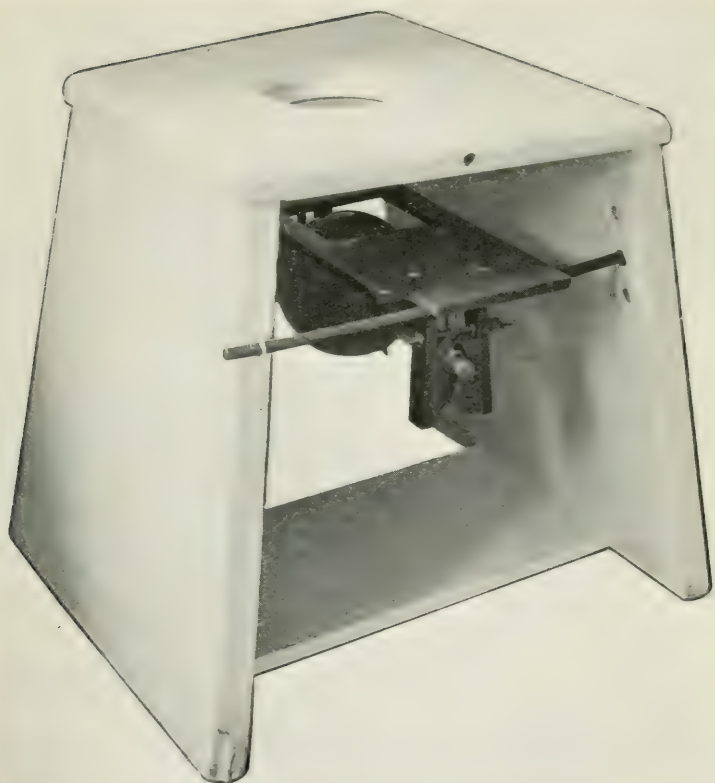
End view of cylinder showing tube in position and method of securing it.

FIG. 12.



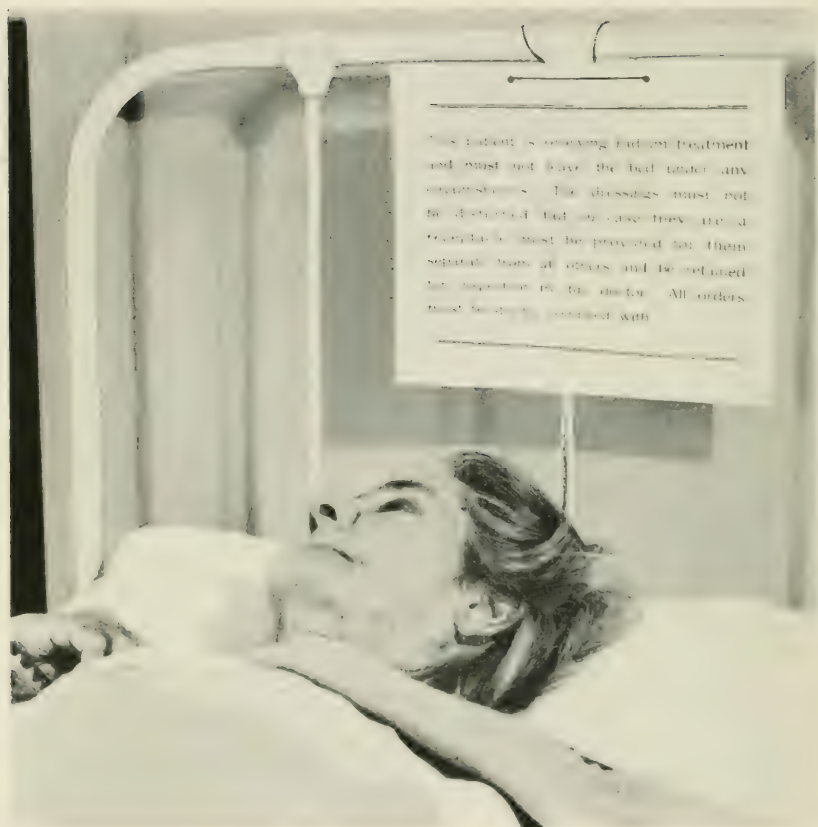
Bronze ball and socket joint for supporting cylinder devised by authors.

FIG. 13.



Perineal treatment stand devised by authors.

FIG. 14.



Placard designed as a safeguard against loss of radium.

to this end have devised a lead-covered cylinder inclosing the tube, which eliminates lead-lined walls, obviates electrical shocks and removes the hazard of X-rays other than those directed through an appropriate opening. The cylinder is not cumbersome and is easily supported to a wooden elevating device by a bronze ball-and-socket joint of special design. It is conveniently raised and lowered two feet by a braided wire cable adequately counterweighted. An angle up to 45 degrees is readily obtained and fixed by turning a wheel which clamps the ball-joint mechanism securely. One end of the cylinder is provided with a hinged door, the other being closed excepting for a 2-inch aperture which receives a rubber hose. Air is forced through the hose into the cylinder by a fan operated at a speed which insures adequate cooling of the tube under any working condition. (Figs. 9, 10, 11 and 12.)

Horizontal movement of patients is accomplished by mounting roller-bearing casters on an ordinary wooden treatment table. This device has been entirely satisfactory.

Another apparatus² of great practical value was produced by the authors to meet the demand for a convenient and safe method for treating the perineum. It is a lead-lined wooden cabinet open on both sides, of convenient height for the sitting posture, with a 6-inch aperture in the top, below which are wooden slots for filters. The tube is suspended directly beneath the opening in the top by a wooden frame supporting felt-lined clamps for the tube terminals, and may be adjusted to 8-inch, 10-inch, or 12-inch anode-aperture distance. Two fibre rods project from either side to hold the high-tension wires safely away from the patient. It is unnecessary to remove the patient's clothing when treating the perineum. (Fig. 13.)

The entire cost of both devices is less than that of the tube-stand now in use and beyond question they are not only better but convenient and safe.

RADIUM THERAPY

Radium is reserved for those cases in which benefit or cure may be anticipated by employing it in the form of needles. Spectacular elements and unnecessary surgical procedures are avoided. Surgical consultation is demanded in all cases of cancer or suspected cancer

² *Jour. Radiol.*, 2: 2, 52, Dec., 1921.

of the cervix or vagina. Specimens are not, as a rule, secured for microscopical diagnosis. If, after careful clinical study and consultation, the lesion is designated as definitely or probably malignant, treatment is instituted. Unnecessary manipulations and examinations are eliminated. The radium container is placed with due regard for character and extent of the lesion, and exceptional pains taken to protect the adjacent parts by gauze packing. Specific instructions are given as to preliminary preparation covering evacuation of bowels and subsequent evacuation of bladder at stated intervals while the radium is in position. (Fig. 14.)

All such cases receive from 3400 to 4000 mg. hrs. treatment given in six to ten applications.

These treatments are followed by deep X-ray therapy, employing voltages of 200,000, 50 cm. distance, $\frac{1}{2}$ mm. copper filter, through four areas—anterior and posterior pelvis and right and left oblique through the thighs. The time factor, of course, varies with the size of the patient.

It is manifestly impossible to enter into a detailed account of any single phase of radiological work in this short communication. It is hoped, however, in future issues of the *INTERNATIONAL CLINICS* to describe and illustrate some of the numerous and varied problems encountered in a radiological clinic, and to point out in detail some of the accumulated data which may be of value to others interested in this subject.

THE EYE COLOR CARD

WITH BRIEF REMARKS ON COLORIMETRY

By HENRY EMERSON WETHERILL, M.D., Lt.J.G.N.F.,Pa. (Retired)

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As Audubon did show the birds and Nuttall the sylvia, so have I attempted to give the medical colors, in useable form, for diagnostic and recording purposes.

The normal eye colors illustrated in the Frontispiece are thirty-one usual shades which are applicable for studying mendelian characteristics, for glass eye measurements, for identification of recruits, for passports, police and detective bureaus, medical-legal work and for various other purposes that will at once suggest themselves to the intelligent reader. The unusual eye colors were not reproduced as they may easily be described, and the color measuring system hereafter to be detailed may, by comparison with the eye color scale, record the differences.

Reducing the color of eyes to a universal standard with a constant scale for comparison and record, enables a more accurate description and identification of the eyes than any method now in vogue. The excellent work of Richards is limited to comparatively few color tables, and the various shades and infinity of color density as judged by the normal eye far exceeds his representations. The expense of such a complete colored glass outfit as that of Lovibond precludes its use by the many who should be interested in this subject. In using the eye color scale to determine one's own eye number, a mirror is placed behind the card, and the result recorded. It will often be found that the inner and outer segments are of different color, or that various arcs show variations in shade. When possible northern daylight should be employed in recording color. For use on patients the sheet may be extracted from the book or the book held in the most easily available manner in order to determine and to record the color values as indicated by the scale. The black background gives a closer matching.

In my universal color scale every gradation of color density and shade is shown, whether primary, secondary, or tertiary, by printing a graded color from zero to one hundred on one-tenth-inch scale, and in then viewing this scale, with its corresponding graded tint, through one, two, three, four, five, etc., thicknesses of colored celluloid. Any one familiar with numerical ratios will at once note the millions of variations that may thus be secured with the various colors, and at the smallest possible expense.

Medicine

THE ASSOCIATION OF DIPHTHERIA WITH TYPHOID FEVER

By ERNEST R. DAX, M.D.

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THE best known and the most frequent morbid associations of typhoid fever are typhoid-malaria and typhoid-tuberculosis. The first of these two processes—association of typhoid with paludism—has been especially studied in France by Kelsch and Kiener and H. Vincent. The second morbid combination has also been the object of numerous publications. Less commonly observed is the association of typhoid fever with influenza, the paratyphoids, the streptococcias and enterococcias. Likewise the morbid association of typhoid with infectious processes—measles, variola, scarlet fever, syphilis—is most infrequent, but some instances are to be found scattered through medical literature.

The association of typhoid and diphtheria has been known for many years past, but it was during the winter of 1914–1915 that the army medical men were faced with real epidemics of this association and were called upon to solve various problems raised by the coexistence of these two infectious processes in the same patient, one a perfect type of human septicæmia, the other a typical toxæmia.

Having had the opportunity of studying a few cases in the past few years it occurred to me that a short study of this subject might not be devoid of interest at the present time.

ETIOLOGY

A certain number of etiological factors appear to be susceptible of favoring the development of diphtheria in typhoid patients. Cases of contamination in hospital wards are exceptional but when

this does occur the contagion is easily explained by the presence in the ward of a nurse, the carrier of the bacillus of the diphtheria, or a patient in whom the infection was unsuspected. In most cases, however, the patient when first seen is already infected by both infectious diseases.

Labbé and Rathery have systematically carried out examination of the throat in all typhoid patients admitted to their services and have reported the following data:

Labbé found by culture the bacillus of diphtheria in 53 per cent. of typhoid cases. Out of a total of 1302 cases of typhoid, Rathery found 109 instances of active diphtheria and 275 cases in which the bacillus was present in the throat. Such high percentages have only been met with in measles by Lemoine who found 40 per cent., and A. Delille who found 42 per cent. of measles cases associated with diphtheria.

These percentages are far higher than those ordinarily noted in healthy subjects, even in places infected by the bacillus of diphtheria. According to Sacquépée the number of diphtheria carriers in contaminated places varies from 4 per cent. to 8 per cent., while it reaches 30 per cent. in the immediate proximity of diphtheria patients.

From these data it is clear that the presence and development of the diphtheria bacillus does not merely depend upon contagion, but also upon a more or less favorable soil offered by the individual. Infectious diseases like measles, and perhaps typhoid even more so, appear to render the pharyngeal structures eminently favorable for the multiplication of the diphtheria bacillus.

The dry state of the mouth which is so special to typhoid predisposes in the highest degree the development of the diphtheria bacillus living as a saprophyte in the pharynx, a condition of receptivity present in typhoid patients resulting from the very special condition of their buccal and nasal mucosæ, particularly favor contagion.

SYMPTOMATOLOGY

In the great majority of cases it is the diphtheria which complicates the typhoid and in order to properly deal with this serious complication it must be detected very early in its evolution, therefore,

I shall dwell upon the symptoms of the onset and with Joltrain, I admit three different conditions as met with in practice, namely:

- (1) Typhoid patients, carriers of the diphtheria bacillus;
- (2) Typhoid patients, with diphtheritic angina and false membranes;
- (3) Typhoid patients, with latent diphtheria or diphtheria difficult to detect.

In the first category I include patients presenting a complete typhoid syndrome and in whom cultures taken from the throat reveal the diphtheria bacillus, although the evolution of the typhoid is in no way modified by the presence of this microbe. They are to be regarded simply as carriers.

In the second category I place typhoid cases in full evolution presenting classical diphtheria with false membrane and cases where the diagnosis is evident. In these circumstances the diphtheritic angina in no way differs from an initial process.

In the third category—the most frequently met with—are to be found those cases having a more complex clinical aspect. These are the patients that are first seen between the sixth and tenth days of their typhoid, the typhoid syndrome usually being complete. Examination of the throat does not offer any distinct evidences of diphtheria so that an exact diagnosis cannot be made, and when the diphtheria becomes evident the patient, prostrate from the typhoid, no longer reacts to the effects of the second infection. It is in these cases that the patient must be closely watched and a minute examination of all the viscera is imperative.

The temperature chart will give no exact indications. There is hardly any increase above the usual 102°F. to 104°F. of the typhoid process.

Examination of the throat will give much more satisfactory data. The physician should not wait until the patient begins to complain of painful deglutition to examine the throat, because this pain may be absent or the patient being in a state of stupor does not complain.

Sometimes the throat is simply red, more or less inflamed, or there may be a slight œdema of the uvula or swelling of the tonsils. The classic false membrane is rarely present. Often there is only a slight opalescent coating difficult to detect in the midst of the sordes

covering the buccal cavity or a mucopurulent coating, grayish in color and slightly adherent, may be seen covering a tumefied mucosa which bleeds upon the slightest touch.

On the other hand there may be no angina whatsoever and the larynx may be the first to be involved. In these circumstances disturbances of the voice are first of all noted; there is dysphonia or aphonia with dyspnoea and cough.

In other patients the diphtheria is first manifested by a nasal discharge. There is a fetid purulent coryza and this may precede the appearance of the false membrane by two or three days, but its existence should cause a bacteriological examination immediately to be made. When the pharynx is examined, pus will often be seen flowing over the posterior pharyngeal surface.

The most striking symptom is the immediate aggravation of the general condition. When suddenly, especially in a typhoid at the phase of decline, stupor, adynamia and delirium develop, diphtheria should be suspected and sought for.

When once installed, diphtheria complicating typhoid undergoes its evolution with a remarkable rapidity and gravity. In twenty-four or forty-eight hours the situation often becomes irremediably grave. The combination of the effects of the diphtheritic toxæmia and typhoid septicæmia produces a series of symptoms that may be termed the phase of full development of typhoid-diphtheria.

The temperature remains high *en plateau* and is not influenced by cold baths. The reactions do not take place. The temperature does not frankly drop after the bath or after applications of ice over the abdomen and cardiac area, and not infrequently it may rapidly rise above the degree at which it had previously been, a fact denoting the profound intoxication of the organism.

The general condition progressively becomes worse. The patient presents an extreme pallor. The urine is scanty and contains much albumin. Vomiting is frequent but not abundant. The pulse becomes small, fleeting, depressible and a condition of cardiac collapse rapidly ensues. Respiration is interfered with both from the nasopharyngeal obstruction and insufficiency of the myocardium, as well as from cardio-pulmonary manifestations of bulbar origin. The

symptoms of myocarditis are very frequent in typhoid-diphtheria, because the two toxins having the same deleterious influence on the myocardium, their respective effects become superadded.

At this phase of full development the pharynx is encumbered with thick grayish false membrane, covering the pharynx, uvula tonsils and soft palate. The submaxillary lymph-nodes are enlarged and painful.

Then suddenly the temperature drops below normal, the limbs become cold, the pulse fleeting and impossible to count and the patient dies in a complex infectious state in which it is difficult to distinguish that which is due to the typhoid and that resulting from the diphtheria.

When the process evolves towards recovery, convalescence is long. Occasionally there may be a relapse. In one of my cases a phlebitis of the left leg and a submaxillary abscess developed.

It is above all in the phase of full development, during the second week of typhoid, that diphtheria becomes declared; it is rarely present at the onset of typhoid, but it is not infrequent during the period of convalescence.

The cases reported by Page (*Brit. Med. Jour.*, 1883), by Granville (*Lancet*, 1882) and Rosenthal (*Arch. of Ped.*, 1903) show that typhoid fever developing during the evolution of a diphtheria does not appear to be in any way influenced by the latter infection.

Complications.—The complications of typhoid-diphtheria are confounded with those of the typhoid. Sudden death from cardio-pulmonary paralysis has been noted several times. In opposition to sudden death there sometimes is a true post-typhoid-diphtheritic cachexia. The cardio-bulbar manifestations are especially frequent. Typhoid laryngitis is often only a manifestation of diphtheria.

Among the complications solely due to the diphtheria is the extension of the false membranes to the nasal fossæ and larynx. The diphtheritic coryza may become complicated with suppuration of the sinuses or middle ear. Extension to the lungs has been noted. One of Labbé's patients died from broncho-pneumonia, the bacillus of diphtheria being found in the pulmonary parenchyma.

Paralysis of the velum, limbs or even the vesical sphincter has been observed. These paralyzes were rather fleeting in some of Rathery's cases.

Clinical Forms.—The enumeration that has been made of the symptoms and complications of typhoid-diphtheria naturally leads to a classification of the various clinical forms of the process.

The asthenic form is the most frequent. The profoundly intoxicated patient lies prostrate in bed. The eyes are brilliant, the expression anxious. A quiet delirium exists. The pulse is small, very rapid, often irregular and intermittent. The respiration is short and frequent. What predominates is the asthenia which causes the patient to be repugnant to all movement.

There exists a form that might properly be called the euphoric in which the patient, not being aware of his serious condition, appears to experience a kind of well-being contrasting to the symptoms observed.

In the cardio-pulmonary form, the patient is suddenly seized by vomiting, hiccough and generalized cyanosis. The pulse becomes small and cannot be counted; the temperature drops, the patient dying in three or four days.

In the dyspnœic form of the asphyctic type, the dyspnœa is intense and arises suddenly. The respiratory movements are short and extremely rapid and in a few days the dyspnœa becomes very severe and the pulse cannot be counted. These cases always die in a few days. The process is an acute asphyctic dyspnœa which is not relieved by tracheotomy.

According to the localization of the diphtheria bacillus one may distinguish a membranous type, a type without membrane with a few isolated whitish spots and a croupal form which was formerly very common before the advent of antitoxic serum.

The state of the kidneys must also play a part in these various clinical forms.

The following cases are given as illustrations:

CASE I.—Female, *æt.* 21 years, returned from Paris where she had become quite tired from sight-seeing. The patient suddenly developed headache, diarrhœa and general malaise and took to her bed on April 30, 1919. At this time the temperature was 103° F.

When seen on May 1, all the symptoms of typhoid were present. It is to be noted that the patient's mother had had a very serious typhoid a few years previously.

The typhoid serum diagnosis was positive. Tongue dry and covered with sordes. A few rose-spots. Pulse small. The back of the throat was red, the tonsils enlarged and there seemed to be a very thin opaline coating over the left tonsil. The submaxillary lymph-nodes were enlarged and painful. A swab was taken from the tonsil exudate and inoculated on serum.

May 2.—The general condition was still bad. The patient was prostrated, did not complain of her throat, but the opaline coating had become an opaque membrane and had extended to the pillars. The culture showed long bacilli. Forty cubic centimeters of antidiphtheritic serum were injected.

May 4.—A second injection of 40 c.c. of serum. The false membrane had become diffuent and was disappearing, but the general condition was still serious.

The patient died on May 10, from cardio-pulmonary accidents, especially bulbar. Delirium, hiccough and cyanosis were present to the last days of life.

CASE II.—Male, entered hospital on February 11, 1915, on the fifth day of a typhoid of medium intensity. He had not been vaccinated against typhoid. Nothing to note in his hereditary or personal antecedents.

Although weak, the patient was perfectly lucid. Rose-spots, tongue dry and covered with sordes. Abdomen distended, ilio-cæcal gurgling. Liver enlarged, spleen could not be palpated. Two dark putrid liquid stools a day.

Heart negative. Signs of marked bronchitis. Temperature, 103° F. Pulse, 108, regular. With Pachon's oscillogram a very marked diastolic murmur was found. Typhoid serum-diagnosis, positive.

The temperature and pulse followed a regularly descending course, but on February 15 the general condition became worse. The temperature went from 102° F. to 104° F., and the pulse, which was 100, went up to 120 and respirations from 28 to 40. A broncho-pneumonia was discovered.

On the days following, the general condition continued serious. The temperature remained around 103° F., the pulse between 110 to 120. Then, suddenly, on February 25 and 26, the temperature fell below 98.6° F., the pulse remaining at 110 and the respirations at 48. At this date a false membrane was discovered on the left tonsil and a bleeding ulceration of which the patient did not complain. A culture was made, as well as a cover-slip preparation and 20 c.c. antidiphtheritic serum were injected. But the general condition did not improve and the patient died on February 26, from a hypertoxic diphtheria occurring on the twenty-first day of a typhoid complicated by broncho-pneumonia.

CASE III.—Male, *æt.* 49 years, entered hospital July 6, 1915, in a state of stupor. The patient's wife stated that he had been in poor health for several months from overwork. For about eight days there had been a temperature of over 102° F. and diarrhœa. No epistaxis, no vomiting.

The patient, in complete prostration, did not reply to questions. Delirium. Abdomen distended, spleen could not be palpated. Examination of the throat revealed false membrane and an erosion on the right side of the velum. A culture was taken and a hæmoculture made. Examination of lungs revealed a congestion at both bases.

July 7.—General condition worse. The body was cyanotic. Pulse small and fleeting. Precipitate respiration with tugging. Culture contained diphtheria

bacilli, associated with staphylococci, diplococci and *Micrococcus tetragenus*. Hæmoculture gave staphylococci and rods.

An injection of 40 c.c. antidiphtheritic serum was given. Temperature was 102° F., but the pulse, which was 102, went up to 132. The respiration, which was 32, went up to 58. Urine contained a great amount of albumin.

Patient died in the afternoon of July 7.

CASE IV.—Male, æt. 16 years, entered hospital September 20, 1915, with a diagnosis of typhoid. He had been in bed since August 15, therefore he had reached the thirty-sixth day of his illness. He had had intense frontal headaches, general lameness in the back and limbs, chills and yellow diarrhœa for eight days, eight to ten stools per day.

For the past eight days the diarrhœa and headache had subsided, but the patient complained of sore throat.

Personal Antecedents.—Acute articular rheumatism two years ago, lasting two months.

Present State.—Patient very weak, complained of feeling lame all over, sore throat and dryness of mouth. Temperature, 103.5° F.; pulse, 84.

Slight cough, no other respiratory symptoms. The first heart-sound somewhat dull.

Tongue coated, dry, and raw on the edges. The throat was slightly inflamed and on the left tonsil a thin opaline membrane was seen. The submaxillary lymph-nodes, enlarged and somewhat painful. Abdomen hard, painful on pressure, with gurgling in the right iliac fossa.

A bit of the false membrane was removed on a swab and 10 c.c. antidiphtheritic serum injected.

September 21.—Bacteriological examination revealed diphtheria bacillus with distinct polar grains. Diazo-reaction positive. Hæmoculture revealed cocci. Slight albuminuria.

September 23.—False membrane disappeared. Temperature, which had been 103.5° F., progressively dropped and was normal on October 2. The pulse curve presented more marked oscillations, varying between 80 and 100 in the same day, but altogether it followed a decreasing course parallel with that of the temperature. The respiration curve did likewise. The urine curve went up until September 24, when it reached 3000 c.c. and then descended until it reached around 2000 c.c.

Convalescence was slow and protracted, interrupted by a phlebitis of the left leg on October 21, and a submaxillary abscess which was incised on October 29.

The patient was discharged well on November 20.

PROGNOSIS

All observers agree as to the gravity of the typhoid-diphtheria association. The influence of the diphtheritic infection on the evolution of typhoid makes itself very quickly felt and within forty-eight hours the situation becomes extremely serious.

In the typhoid-diphtheria epidemic observed at the Zuydcoote Hospital, totaling 109 cases, Rathery established the following facts:

Taking into consideration—during the same number of weeks—the mortality of typhoid uncomplicated by diphtheria and that of typhoid-diphtheria, he was able to verify that the latter was three times greater than uncomplicated typhoid.

Up to June 1, 1915	No. of cases	Deaths	Percentage
Typhoid	3712	415	11.1 per cent.
Typhoid-diphtheria	109	32	29 per cent.

This mortality resulted almost exclusively from the extreme frequency of cardiac and cardio-bulbar disturbances and finds its explanation in the fact that the typhoid and diphtheria toxins combine their effects, hence the gravity of the morbid evolution is considerably increased.

The following table taken from Rathery's statistics gives the exact cause of deaths from typhoid-diphtheria in his service.

Sudden death	3
Death from cardiac or cardio-bulbar disturbances.....	18
Death from meningeal nervous accidents.....	5
Death from accidents due to extensive false membrane.....	1
Death from gangrene.....	1
Death from erysipelas of the face.....	2
Death from phenomena of late cachexia.....	2
Total....	32

Out of a total of fourteen cases, Labbé had five deaths, otherwise 36 per cent., while in the entire epidemic of typhoid observed by him the mortality was only 15 per cent.

Méry mentions eight cases, two of which were convalescent, in which the evolution of the typhoid-diphtheria was perfectly simple. In six other cases observed during the height of the typhoid there were five deaths.

Bonnamour had a mortality of 75 per cent., Bourges, 65 per cent. and Mazuré, 80 per cent.

Has the time of the morbid evolution at which the diphtheria develops any bearing on its degree of gravity? While some observers as Bonnamour and Arloing, of Lyons, maintain that the association of typhoid with diphtheria occurring during the end of the evolution of the typhoid is more serious than when this takes place at the onset of the typhoid on account of the hypersensibility of an organism

saturated with typhoid toxins to a superadded toxin, I have noted in the few cases coming under my observation, as well as in the cases reported by Méry, Labbé and Bourges, that the only cases ending in recovery were precisely those in which the diphtheria occurred at the time of convalescence.

Does the gravity of the typhoid itself influence the prognosis, as Sanné maintains? Personally, I suspect that the prognosis depends above all upon the early recognition of the diphtheria and every Klebs-Loeffler infection that is overlooked for one or two days renders the prognosis very bad.

DIAGNOSIS

The diagnosis of typhoid-diphtheria depends upon one essential condition, namely, that it should be early. Bacteriological diagnosis is the only one of certitude, the clinical diagnosis based upon indefinite data is far from always being easy. The diphtheritic complication often develops insidiously and no reaction is noted in the patient, plunged as he usually is in typhoid stupor.

According to Joltrain, a developing diphtheria should be suspected every time in typhoid or paratyphoid when an abnormal temperature curve, bad general condition, vomiting, pallor of the face, albuminuria, asthenia, a small rapid pulse and redness of the soft palate with slight œdema of the uvula are present. Unfortunately when this symptomatic complex has become manifest, it is usually quite late in the diphtheritic process.

In practice, the aspects of the diphtheria in typhoid are so very polymorphous that it should be a rule to examine daily the throat of every typhoid case and to isolate any patient with a suspicious throat.

What does a suspicious throat imply? In the mouth of a typhoid patient, filled with sordes and concrete mucus, it is often difficult to distinguish a false membrane, all the more so when in the beginning it is represented by a thin opalescent coating, on a slight œdematous uvula.

In all cases one should be suspicious of any ulceration or any exudate and a tonsil or soft palate covered by the slightest whitish or grayish-white coat should be regarded with distrust. The vulgar

white spot of the cryptic tonsil should be examined bacteriologically and often will be found to contain the diphtheria bacillus. In many cases, a tentative diagnosis of diphtheria from an angina with false membrane may be made, but this must always be confirmed by bacteriology. The peculiar characters of pultaceous coatings and lacunar and cryptic anginas should not be neglected microscopically or bacteriologically. As to streptococcal, staphylococcal, pneumococcal, colon bacillus and tetragenous pseudo-membranes, their differential diagnosis can only be made bacteriologically.

If ulcerations are seen they might be regarded as the typhoid type described by Duguet, seated more often on the anterior pillars at the union with the soft palate. They always develop during the first week of typhoid, but Schaeffer has never been able to obtain a culture of the typhoid bacillus from them and it is probable that secondary infections play a certain part in their production.

The diphtheroid form of Vincent's angina with a thick, gray and friable membrane hiding a deep ulcer can be diagnosed by direct examination of the superficial scrapings from the ulcer which reveals the fuso-spirillum association.

I would also mention the possibility a diphtheroid syphilitic chancre, herpetic angina, gangrenous stomatitis and thrush as lesions to be differentiated.

Martin has referred to a certain number of causes of mistake in bacteriological diagnosis, an error may occur when a throat has been previously treated with antiseptics. A negative bacteriological finding may be due to the fact that the specific bacillus is in the larynx or posterior pharynx.

In two cases reported by Méry in which the clinical signs were perfectly distinct, bacteriological examination repeated twice was both times negative. This also occurred in a third case but a culture made a little later revealed the presence of many medium and long diphtheria bacilli.

Hence I would make it a rule that clinical indications are by themselves sufficient to necessitate an immediate injection of anti-diphtheritic serum without waiting for a laboratory report, and even should this be negative serotherapy should be continued.

GERM CARRIERS

The subject of germ carriers is a most important one, from the viewpoint of diagnosis, prognosis and prophylaxis. From the viewpoint of etiology the importance of these vectors of bacilli is well known and I would again refer to the figures obtained from a large number of examinations made in the hospital services of Labbé and Rathery because they show the considerable proportion of typhoid patients with diphtheria bacilli in the throat.

At the Zuydcoote Hospital, Rathery examined 1302 cases of typhoid which resulted in the finding of 109 cases of true diphtheria and 275 cases of germ carriers (diphtheria) of which 119 gave cultures containing medium and long bacilli and 146 with short bacilli.

During April, 1915, Labbé discovered the diphtheria bacillus in 53 per cent. of his typhoid cases and after the end of the epidemic, 41 per cent. of the patients were carriers.

It would at first seem that such a large number of germ carriers might lead to the conclusion that the presence of this bacillus in the throat is of little importance, because the typhoid patients carriers of germs do not all develop diphtheria and the proportion that do is small, in Labbé's wards it was 9.2 per cent. But these subjects are more exposed than other typhoid patients, especially those whose rhino-pharynx harbors the medium and long diphtheria bacilli.

The presence of the diphtheria bacillus in the throat of typhoid patients should not be regarded lightly and Rathery has given the proof by showing that in his wards the germ carriers were grouped in islands, so to speak, having the same type of diphtheria bacillus.

Martin and Loiseau have recently described a rapid procedure and a culture medium for differentiating the diphtheria bacillus from the pseudo-diphtheria bacillus.

For the bacteriological diagnosis of a fibrinous diphtheritic membrane, culture on serum leaves no doubt; 95 per cent. of bacilli derived from an angina or pseudo-membranous croup are virulent for the guinea-pig and are unquestionably diphtheritic. On the contrary, when germ carriers are examined from 20 per cent. to 75 per cent. of them will give cultures of rods on serum in twenty-four to forty-eight hours which cannot be classed as diphtheritic until

passed through test medias. In reality 2 per cent. to 5 per cent. are diphtheritic, the rest are inoffensive pseudo-diphtheritic germs.

In order to differentiate them, Martin and Loiseau, starting from colonies obtained on coagulated serum after a series of stab-cultures in order to obtain pure colonies, inoculate glucose and litmus gelose. In eighteen hours a true diphtheria culture can be recognized; the colonies of the diphtheria bacillus are visible the entire length of the stab, which has become red. The surface is free. Tubes inoculated with pseudo-diphtheritic bacilli remain blue; the colonies are abundant on the surface and not in the stab line.

The existence of long or medium bacilli is not alone a valuable datum. The carrier of the short type of bacillus should also be regarded as dangerous as long as Martin and Loiseau's test has not settled the question.

In practice, germ carriers having the short type of bacilli should be isolated from those harboring the long and medium types until the diagnosis has been established.

Labbé has made the following remarks: Typhoid fever does not merely cause the diphtheria bacillus to multiply in the throat. It also favors the substitution of the short bacillus for the medium and long bacillus. He mentions a case of a carrier of the short bacillus when he entered hospital, but six days later this carrier developed a pseudo-membranous angina containing the long type of bacillus. Another patient who had had a diphtheritic angina during a typhoid and whose throat was bacillus free, had a relapse of the typhoid; at first the short type of the diphtheria bacillus was found, then afterwards the long type and this in turn gave way to the short type at the end of illness and finally the patient was discharged bacillus free.

From the prophylactic viewpoint—although it may be admitted the carriers themselves are little inclined to develop diphtheria, perhaps being partially immune as can be demonstrated by Schick's method—it is certain that they are real agents of contagion for their fellows. This fact fully justifies the very careful prophylactic measures that should be carried out, measures all the more severe when one recalls the long persistent presence of the diphtheria bacillus in the throat of carriers. It may be found in cultures for weeks or months and it may also be present intermittently.

TREATMENT

This is extremely simple to formulate, being the systematic usage of antidiphtheritic serum repeatedly injected in large amount. The effect of the serum on the temperature and the general condition will, so to speak, confirm the diagnosis. Joltrain mentions twelve cases with high temperature in whom an injection of 40 c.c. serum brought it immediately down to 98.6°F., while baths, cold packs and colloidal injections had had no effect.

From 40 c.c. to 60 c.c. should be given at once and an injection of 40 c.c. should be given once daily for several successive days. The anaphylactic phase must then not be allowed to pass, hence during this phase injections of from 10 c.c. to 20 c.c. of serum should be given. When a recrudescence of the angina occurs at the height of the anaphylactic phase the serum injections must be given, just the same care being taken to first give serum *per rectum*, then an injection of 1 c.c. to 2 c.c. and lastly the massive dose. Calcium chloride, thirty grains, should be exhibited the first two days and fifteen grains on the two following days.

With the diphtheritic serotherapy one should associate the exhibition of adrenalin systematically, giving either the extract in the more serious cases or adrenalin, gtts. xx for four days in succession. In serious cases the serotherapy should be combined with the administration from xxx, xl or l gtts., of a 1:1000 adrenalin solution.

Besides antidiphtheritic serotherapy in large doses and adrenalin, the typhoid must itself be treated. The patient should be moved as little as possible. Ice is to be applied to the abdomen and over the cardiac area. A saline or sugar solution should be given *per rectum* by Murphy's drop method and in case of pulmonary manifestations the thorax is to be enveloped and camphorated oil, ether and strychnine are to be given hypodermically.

Lastly, the throat should be irrigated with Liq. Labarraque, 1 or 2 soup-spoonfuls to 1000 c.c., and morning and evening a resorcin ointment should be introduced into the nasal fossæ.

The prophylactic treatment is more interesting and is based upon the detection of germ carriers. After having systematically examined the throat of every typhoid patient the germ carriers are to be isolated and a prophylactic injection of antidiphtheritic serum

given them. The prophylactic action is not absolute, but it probably reduces the gravity of the diphtheritic complication.

The mouth should be cleansed four times daily with the following solution:

R

Liq. Labarraque,

Sol. acid. boric, 3 per cent. āā 100 c.c.

Aquæ, 800 c.c.

and the following ointment is introduced into the nasal fossæ:

R

Gomenol, 1 gram

Aristol, 0.75 centigram

Resorcin, 0.25 centigram

Lanolin

Vaselin, āā 15 grams

Locally, dried diphtheria serum should be applied by insufflation. It is to be noted that the powdered serum, according to the latest views, is not absolutely indispensable for causing the disappearance of the bacillus from the throat as it has been found that the powdered serum of the pneumococcus or streptococcus accomplishes the same results.

To avoid the dissemination of the diphtheria bacillus in cured typhoid-diphtheria cases, but where the patient is found to be a germ carrier, he should be confined in an isolation ward until repeated examinations have shown that the diphtheria bacillus has completely disappeared.

CHRONIC BASAL LESIONS*

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THE present paper deals very briefly with a limited group of chronic infective diseases of the lung and pleura. It excludes definitely specific conditions, for example, tuberculosis, syphilis, the mycotic infections such as actinomycosis, blastomycosis, etc., also pulmonary distomiasis and hydatid disease of the lung. Excluded also are cases exhibiting symmetrically diffuse processes such as chronic bronchitis, asthma, emphysema, and pneumoconiosis, unless they have developed definite focal lesions, that is, localized infiltration or cavity formation, or both. How many cases of this chronic infective type at the present time are the result of the influenza epidemic of 1918 is problematical. Doubtless many of the cases of delayed resolution following that epidemic are no longer infective and at most show only fibroid evidences of a former infection. The group under present consideration usually contains a number of different organisms in the inflamed area, though one variety may predominate.

The onset in a number of these cases is with an inhalation pulmonary abscess, in some with a pulmonary embolism, while quite frequently they begin as broncho-pneumonias, either a primary broncho-pneumonia, many varieties of which have appeared in the last few years, or one secondary to an acute infectious disease like measles or pertussis. Frequently the onset is insidious as in many cases of tuberculosis. Inhaled foreign bodies unremoved for many months or years almost invariably are associated with chronic pneumonitis. While the cases show chronic inflammatory changes in the lung or pleura, a striking feature is often found in cavity formation, especially of the lower lobes. Cases with a chronically

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infected pleura, whether or not associated with an infective pneumonitis, are included as very important members of this group from the diagnostic standpoint.

The lesions of this group, as in other non-tuberculous infections of a chronic nature, are very apt to escape the pulmonary apices and often are limited entirely to the bases, furnishing the so-called basal type of involvement. The explanation for this predilection for the lower lobes, at least in the aspiration cases, seems to be the same as for the similar localization of inhaled foreign bodies, that is, it is the result of gravity, plus the more direct continuation of the lower bronchi with the trachea, especially on the right side.

However, upper lobe involvement with expectoration is no uncommon finding in this group of cases, as has been demonstrated many times, so that we must be on the alert in all patients showing definite sputum persistently negative for tubercle bacilli. According to some reports there is a special preference on the part of children for such upper lobe involvement.

On the other hand purely basal lesions are much less susceptible of diagnostic uncertainty, being rarely proved to be tuberculous.

PATHOLOGY

The pathology of chronic infective pneumonitis after a long latent period has recently shown signs of new life, especially in the hands of such men as Wessler and Aschner, working with diseased lobes removed at operation. Only a few features in the pathology will be very briefly alluded to here. In the gross, one is struck with the non-collapsibility of such specimens, by their tough, rigid and resistant feel. Microscopically some of the outstanding features are great increase in fibrous tissue, infiltration of the tissues with leucocytes, various degrees and extent of bronchial and pulmonary necrosis, and frequent various sized cavities, many lined with epithelium, some only partially so lined, and some entirely without such lining. Even such an incomplete picture helps one to visualize the factors that make any treatment except operative but little better than an amelioration and improvement of the patient's condition, cure being almost out of the question. On the other hand, of course, many cases have not reached so advanced a stage. In most cases,

even those with considerable cavity formation, the surrounding pneumonitis will be found to play a very important part in the disease process, for example, as an obstacle to treatment.

An interesting demonstration by Aschner has been the large proportion of abscesses following tonsillectomy in which the abscess is primarily localized in the course of a bronchus, developing a true bronchiectatic abscess cavity, the other changes in the lungs being secondary. This is a type of bronchiectasis differing fundamentally in its origin from those types dependent on shrinking fibrous tissue external to the bronchi.

A word in passing might be said regarding the size of the cavities. Clinically a patient may have copious expectoration eliminated periodically with no evidence of cavity on physical or X-ray examination. The multiple small, often only microscopical, cavities demonstrated outside the body would seem to furnish an explanation for some of these cases.

MODE OF ENTRY OF INFECTIOUS AGENTS

Chronic pulmonary infections may originate primarily (1) through entry of organisms *via* the air passages; (2) through the blood or lymph-stream, for example, embolism; (3) by direct extension from neighboring structures; (4) by traumatic introduction through the thoracic parietes.

Recent years have demonstrated a constantly increasing proportion of pulmonary abscesses following operations on the upper respiratory tract as due to inhalation of infective material. Likewise there has been a decrease in the so-called post-operative pneumonias following operations on all parts of the body, the pulmonary inflammation to-day being more commonly ascribed to aspiration or embolism. According to one report (Hampton and Wharton, Johns Hopkins Hospital) in only 10 per cent. of cases of pulmonary infarct following gynæcological operations is a correct diagnosis of infarct made.

ETIOLOGY AND PREVENTION

Chronic infective pneumonitis once firmly established is so often past any but palliative treatment, in many cases being more resistant to our efforts than tuberculosis itself, that one's interest natur-

ally becomes aroused in the prevention of such hopeless stages. Eliminating exposure to possible causative agents, or handling the disease in its early stages, are often valuable lines of attack. The more we can know, then, about the primary etiology of the disease, and its treatment in the early stages, the more successful will be our preventive results.

The knowledge that most post-tonsillectomy lung abscesses are due to inhalation of infective material from the upper respiratory tract has lead to the greatest interest in the subject and to a vast deal of concerted effort to prevent such a development. Likewise the knowledge that operations not only in the upper air passages, but elsewhere over the body, conducted under general anæsthesia may permit the inhalation of infective material, has resulted in many quarters in every attempt being made to protect the patients from this accident while under the influence of the anæsthetic. The so-called deglutition pneumonias may be included in this class. It is very encouraging to note the increased interest manifested in the post-operative group of respiratory diseases. The need for such attention has been shown by many figures, for example, those of Decker who, in over 50,000 operative cases collected from various sources, found complications in the respiratory tract to have developed in from 1.2 per cent. to 3.5 per cent. of cases in different series, with a mortality of from 0.1 per cent. to 1.1 per cent. In addition, an anæsthetic should be avoided when possible in the presence of any acute infection of the upper respiratory tract, and where feasible operations should be postponed till chronic infectious processes in these regions can be cleared up.

Acute and chronic inflammations in the upper air passages such as acute colds, gingivitis, and paranasal sinusitis should be properly treated, this warning, according to some, being especially applicable to those who snore or use narcotics.

The acute infections such as pertussis, measles, influenza, etc., are prone to develop broncho-pneumonia which may render the patients potential cases of chronic infective pneumonitis. This is true also of primary broncho-pneumonias, but only in a very small percentage of lobar pneumonia cases. Most of the chronic infective processes following lobar pneumonia are empyemic in character.

Foreign bodies in the lungs if not removed, usually result in a chronic infective pneumonitis, very closely simulating, according to Jackson, chronic pulmonary tuberculosis.

Many properly selected abscess cases yield satisfactorily early in the disease to artificial pneumothorax, or drainage through the thoracic wall, such treatment usually proving of no avail or being much less serviceable in patients allowed to go to a chronic stage.

External traumata with or without penetration of foreign bodies into the pleura or lung may be associated with conditions that will eventually lead to a chronic inflammation of the lung or pleura. The developments of war surgery have shown how much preventive work can be done along these lines, for example by artificial pneumothorax.

One of the most fertile fields for prevention of chronic infective pulmonary and pleural conditions lies in the early and proper treatment of empyemata. Left to themselves they may long maintain foci of infection even after considerable operative work has been done. Later on the diagnosis and the localization of the infected focus becomes progressively more difficult, and, even if an operation or a spontaneous rupture relieves the condition, the baneful effects of the fibrosis still continue.

The relief of stenotic and obstructive conditions of the bronchi may save the loss of an entire lung, for example, when an aneurism threatens to exert compression on the main bronchus of the left lung.

History.—The great value of a thorough history of the case in clinical work is nowhere better demonstrated than in many forms of chronic infective pulmonitis. Not only may the history by itself almost make the diagnosis, but in some cases the diagnosis cannot be made without an adequate history. A typical example is seen in those tonsillectomy cases that about ten days to two weeks after operation become acutely ill and suddenly expectorate a quantity of foul-smelling pus. Any case with an acute onset may come under suspicion, especially if the symptoms follow an operation carried on under a general anæsthetic, or performed for an inflammatory condition. Occasionally close questioning will direct attention to a foreign body inhaled long previously and forgotten by the patient till properly plied with questions. An acute onset and even a

violent one, of course, may initiate a chronic tuberculosis. A history of empyema should always make one investigate whether such a focus persists. A thorough knowledge of the etiology of chronic pneumonitis will furnish many useful hints for developing the history. In cases with insidious onset the histories may closely simulate tuberculous records. As in tuberculosis, there may be marked intermissions in the symptoms.

Subsequent to the onset of the disease many important data may be revealed by a good history. This subject will be further considered under symptomatology.

SYMPTOMATOLOGY

The symptomatic picture of chronic tuberculosis is so often reproduced in other forms of chronic pulmonitis that mistakes have been all too common in diagnosis. One should be cautious in diagnosing tuberculosis too carelessly, and should constantly have in mind these other forms of inflammation. Chronicity, long life, exacerbations with remissions, are common to both. All grades of severity are encountered in the two classes of cases from an almost entire absence of symptoms to a marked severity in the manifestations.

Three classes of symptoms will be briefly considered, these classes being found in tuberculosis and other chronic pulmonary affections, namely, the toxic symptoms, the local or pulmonary, and the mechanical.

Under the toxic we have the usual manifestations of fever, weakness, loss of weight, night sweats, gastric upsets, dyspnoea, etc. Their severity by no means always parallels the amount and foulness of the sputum.

The pulmonary symptoms appear particularly as pain, cough and expectoration. The expectoration may appear in large amounts, periodically eliminated. These factors plus a foul odor should make us very wary in diagnosing tuberculosis, for the percentage of tuberculosis of this type is small, even though the absolute number is considerable. However, very little sputum may be present. Hæmorrhages are common in non-tuberculous conditions and may be very deceiving. They are of all sizes from small to very

large. Sometimes they follow the coughing up of a large amount of purulent material. Occasionally they occur early in the disease.

Mechanical effects as in tuberculosis may arise in two ways. First, there may be a destruction of normal lung tissue, reducing the available alveolar surface. Secondly, there may be the harmful influence of abnormal tissue, often fibrous, on adjacent organs and other structures. The heart and diaphragm and neighboring organs are especially apt to become implicated in this way. Symptoms mechanical in origin may be marked with little pulmonary destruction and with slight or no toxæmia.

A very interesting group of symptoms in basal lesions is manifested below the diaphragm in the abdomen. Not only is the diaphragmatic function seriously embarrassed but the mechanical effects are indirectly transmitted to organs below. In addition there are the reflex symptoms below the diaphragm. This results because the basal lesions are apt to involve the lower intercostal nerves which supply the inferior thoracic regions, part of the diaphragm, and also quite a large part of the abdominal wall (Capps, Kelly and Weiss). If, in addition, the patient is suffering from toxæmia, we have a combination of factors prone to produce abdominal symptoms. A knowledge of these factors may be of distinct diagnostic assistance, for these symptoms can be very misleading. While more interest has been displayed in the abdominal manifestations of acute pulmonary and pleural basal conditions, there is constantly being aroused more interest in sub-diaphragmatic manifestations in the chronic types.

The good nutrition and general appearance of many of these patients, and absence from toxæmia, often strikes one forcibly, especially when there is considerable expectoration, but such encouraging features are apt to be in marked contrast with their capacity for endurance, which may be very slight and associated with considerable dyspnœa on slight exertion.

Inhaled foreign bodies, while in most cases associated with a considerable loss in general health, occasionally may be present in the lungs over many years without much disturbance to the patients except cough and expectoration, with a certain amount of dyspnœa

on exertion. Removal of the foreign body under these circumstances may restore the patient to perfect health.

It is unnecessary to give in detail the distressing picture of those patients weakened by toxæmia and cough, constantly raising large amounts of foul tasting and smelling sputum, a severe trial to themselves and their associates, with no relief in sight except perhaps an operation, which in the best of hands can guarantee no better than a high mortality (42.8 per cent. where a single lobe was removed for disease limited to that lobe, Lilienthal).

PHYSICAL SIGNS

In chronic infective pneumonitis, non-tuberculous, the physical signs of the chest may show scant abnormalities, possibly none at all, especially in certain mild types and those with central lesions. Slight asymmetry of the two sides, and slight limitation of motion on one side, with diminished breath sounds may coexist along with quantities of foul-smelling sputum, marked clubbing of the fingers and bronchiectatic cavities that can be clearly demonstrated by X-ray. Again, the chest signs alone may indicate extensive disease. If the physical signs show abnormalities only at the bases probably a non-tuberculous lesion is present, but knowing the difficulty of excluding apical involvement on physical examination alone, we naturally invoke to our aid the sputum, X-ray and other methods of diagnosis. Given an apical lesion with a more marked basal lesion, we must have a very open diagnostic mind. Even with the upper chest alone involved, we must not be hurried incautiously into a diagnosis of tuberculosis.

Visible evidences of toxæmia may be distinct or very slight, even absent, but should always be carefully investigated as they may give us more information than any other manifestations of the absorption of toxins.

During acute exacerbations, and sometimes constantly, marked toxæmia will be present. Other cases will on nearly all occasions give a general appearance of good health, along with a normal or hyper-normal weight, but are apt to show slight cyanosis and become readily dyspnoëic on exertion. In other words, the toxic influences may be in abeyance while the physical factors are potent.

The nails and fingers in chronic pneumonitis in a high proportion of cases show abnormalities which often are very marked. Simple curving of the nails and even more distinct clubbing of the finger-tips should always, in doubtful cases, direct one's attention actively to non-tuberculous possibilities. An acute onset of the clubbing, for example, within six weeks of the development of a pulmonary abscess or unrelieved empyema, is an extremely uncommon phenomenon in chronic pulmonary tuberculosis. Clubbing may be the most prominent of all the physical signs and its recognition may prevent one from falling into serious error. Nail changes other than simple curving are also worthy of investigation. Definite chronic pulmonary osteo-arthritis develops in some cases. Marked nail and bone changes seem especially often, but by no means invariably, to affect those with large amounts of expectoration, especially when coming from the lower lobes where the drainage is poor.

In many of these patients after the disease has become established in a chronic stage there may be very little tendency to spread, and changes in physical signs then will be largely due to the slowly contracting fibroid tissue. This lack of extension may be noticed in many histories of inhaled foreign bodies, even after the lapse of many years.

The presence of cavities in these cases, basal or otherwise, presents no unique physical signs, nor will an examination of the chest even with demonstrable cavity tell us its nature, whether bronchiectatic or other.

In Wessler's 100 cases of chronic infective pneumonitis the physical examination revealed a cavity twelve times and the X-ray forty-five times. The X-ray, however, while long on cavities, is short on some other thoracic abnormalities, physical signs giving more information, this being true in certain types of chronic pulmonary disease.

SPUTUM

Close study of the sputum will often yield an ample reward. Some stress has already been laid on observing the odor of the sputum, its quantity, and whether it tends to be eliminated periodically.

Other gross characteristics deserve investigation, such as how thick the sputum is or how watery. Reliance cannot always be placed on the patient's description of the sputum. The nose and mouth may contribute quite a proportion of it. A word of warning may be spoken against placing too much diagnostic dependence on the three-layer test of the sputum (dense flocculent deposit, fluid, air), a large amount of any purulent sputum left to stand sooner or later showing this result of decomposition.

One of our best aids and almost an absolute requirement in eliminating tuberculosis as the cause of a chronic infective process with expectoration is the failure to find tubercle bacilli in the sputum after repeated attempts carried on by proper methods. That care should be exercised is proven by finding tubercle bacilli in lungs at autopsy with negative sputum during life and over long periods. In so-called purely basal lesions such negative findings exclude tuberculosis. Constantly negative sputum in apical cases with free expectoration may leave the matter of diagnosis an unsettled question, unless other data furnish the clue.

In cases of chronic non-tuberculous disease a great variety of organisms have been reported as occurring in the sputum, for example various forms of staphylococci, streptococci, and pneumococci. Not infrequently the influenza bacillus has been recorded as the predominating offender, and cases of chronic apical influenzal pneumonitis have been described (Lord). Recently Davis and Pilot have emphasized the importance of the combined association of *Bacillus fusiformis* and Vincent's spirochete in various putrid bodily secretions, including those of a pulmonary source. Unfortunately, so far not much helpful work has been reported on the microorganisms present in portions of lungs removed at operation.

Elastic tissue is sometimes found but usually is of no great value from a diagnostic standpoint.

X-RAY

While the X-ray in many of the doubtful cases cannot furnish all the desirable information, yet it is an instance of "when a feller needs a friend," and the X-ray stands by us a true friend in time of need, albeit unable to tell us all we want to know.

The subject of the X-ray will be referred to only to emphasize its great importance in many cases, and to sound a note of warning as to its limitations in others.

The X-ray will frequently reveal more than physical signs, for example, in the extent of the lesion, the changing character of some lesions, in locating deep-seated lesions, in demonstrating cavities, in helping to exclude the presence of lesions, for example, at the apex or elsewhere, in revealing diaphragmatic involvement, etc.

In some types of chronic pneumonitis the physical examination will reveal more than the X-ray.

The degree of the toxæmia and the patient's general health will often have to be determined entirely apart from the X-ray.

As an aid to diagnosis between tuberculous and non-tuberculous conditions more value will be derived from the location of the lesion than from its appearance.

EXPLORATORY PUNCTURE

In the long-standing cases of chronic inflammation exploratory puncture is rarely to be used, though it has its distinct indications in a few cases. So far, I have only recommended its use in order to determine whether the pleural cavity might contain pus.

BRONCHOSCOPE

This instrument, where available, adds considerably to the interest of cases of chronic infective pulmonitis. One of its most striking exhibitions has been in association with the removal of foreign bodies from the bronchi, and in recognizing foreign bodies undiscoverable by the X-ray. Jackson considers that all cases of bronchiectasis of undetermined etiology should be examined for the possible presence of foreign bodies unrecognized by other means. It has also yielded valuable information and treatment where foreign bodies play no part. Suction by the aid of the bronchoscope clears out cavities and makes them clearer on the X-ray films. Combined suction and injection of bismuth or barium have furnished truly wonderful pictures. The bronchoscope is of special value in revealing local conditions in the bronchi, such as inflammation, tumors and stenoses, and may give the clue to extra-bronchial processes, such as aneurism or neoplasm.

DIAGNOSIS

As introduction to this brief discussion of diagnosis of pulmonary affections may be given the valuable advice, keep non-tuberculous lesions constantly in mind. A second piece of general advice is to investigate doubtful cases most exhaustively, at times a valuable clue coming from an unexpected source. The history, the symptoms, and all available aids should be brought to one's assistance. It is often difficult, at times impossible, to separate these cases from those suffering from tuberculosis and at times both may exist. But one has no excuse for negligence when the proper warning appears, namely, sputum of sufficient quantity constantly negative for tubercle bacilli by approved methods. Such negative sputum with a lesion demonstrable only at the base makes tuberculosis most unlikely. A lesion limited to the upper pulmonary zones, if the sputum is negative, should not be hastily diagnosed as tuberculous. Chronic central lesions with the apices clear may offer considerable diagnostic difficulties. The average case of pulmonary tuberculosis travels from apex to base, unlike most cases of chronic non-tuberculous disease. An old infected non-tuberculous pleura may affect different sites and offer much diagnostic uncertainty. Cases with acute onset are suspicious of non-tuberculosis and may be definitely shown to be non-tuberculous if other important early data can be elicited. An insidious onset does not help in these cases. An acute development of club fingers points against tuberculosis. Good nutrition and general health except for marked dyspnoea and the periodic elimination of large quantities of sputum, especially attended with few abnormal physical signs, warrant suspicion.

The diagnosis between the group of cases herein described and other chronic non-tuberculous pulmonary diseases offers a broad field for study. Mention has been made of a number of these, some having a specific etiology like syphilis, actinomycosis, etc., others of them being found in cases of chronic bronchitis, asthma, emphysema, the pneumoconioses, cardio-pulmonary conditions and neoplasms.

In this place brief reference will be made only to the single disease, syphilis of the lung. While its frequency has been overestimated in some quarters, a number of cases have been found in adults at autopsy, and a larger number have been diagnosed as

syphilis or strongly suspected during life, in which the subjective and objective evidences have shown marked amelioration or even cure under antiluetic treatment. Certainly every case of chronic pulmonary disease otherwise unsatisfactorily explained should be closely studied for syphilis. Naturally, those with a positive Wassermann will receive appropriate treatment. A negative Wassermann does not close the case as both the acquired form of pulmonary syphilis in adults and the congenital form delayed to adult life may give negative findings. Care must be exercised not to overlook suspicious evidences of syphilis, whether in the history and symptomatology or in objective findings outside the lungs.

Syphilis of the lung in adults is apt to appear about the hilum or base and sometimes shows a striking predilection for the right middle lobe, but a number of cases of apical disease have been ascribed to syphilis and have been reported to have improved markedly under anti-syphilitic treatment. Dunham believes that positive physical findings in the chest with negative X-ray readings should strongly suggest syphilis.

The use of specific treatment as a therapeutic test in chronic pulmonary cases of unknown etiology is constantly presenting itself for our consideration. Of course, as long as there is any suspicion of tuberculosis, potassium iodide should not form part of this treatment. The possibility that the clearing up of a lung after specific treatment may be simply a coincidence will have to be considered in some cases.

A very important and often difficult group of cases diagnostically (not to be considered here) are those with both tuberculous and non-tuberculous pulmonary infective processes.

TREATMENT

Prevention where possible has been emphasized because of the notoriously difficult and hopeless problems in treatment presented by most of these cases, once they have been allowed to run on for months or years with consequent well-established infection and fibrosis. The general advice is most faulty which recommends putting off operative treatment, chiefly artificial pneumothorax and

drainage externally, with the forlorn hope that the cases will go on to a spontaneous cure. A state of incurability is established in some cases in a few weeks. By the end of a few months and especially beyond six months, cure is dangerously rare. One case of pulmonary abscess, now at Oteen, looks like a cure after three years, most of this time the patient having been seriously ill. But such a case furnishes only a gambler's chance, something like those rare cases of inhaled foreign bodies which lie dormant in the lung for years entirely without symptoms. Treatment of these chronic cases differs markedly from that indicated in the acute or early stage, when pneumothorax or drainage often promises good results. Palliation with some improvement is the best our treatment offers most of the late unfortunates.

The possibility of an inhaled foreign body must be kept in mind in these cases, for the patient may have entirely forgotten such an accident, or may yield a correct account of the occurrence only on close questioning. The X-ray will usually settle the question. Jackson has demonstrated the wonderful results of complete lung recovery when foreign bodies of long standing, and associated with local inflammatory processes, have been removed.

The patient's general health should be cared for in every way. Fresh air, good food and sufficient rest are indicated. Unfortunately, such treatment fails to yield much in results, often much less than when applied to tuberculous lung lesions. The two types of cases respond very differently to similar treatment, and this is true of the two classes of diseases when involving other parts of the body, for example the bones. However, every hygienic method of treatment should be utilized to its fullest extent. Prolonged rest is especially to be tried in those who intermittently have large hæmorrhages. Toxic cases should have more rest than is frequently advised.

The various organs of the body should be investigated for therapeutic indications, particular attention being devoted to the upper respiratory passages and adjoining sinuses.

Drugs.—Drugs have only a limited value in these chronic conditions. There are no specifics. Symptomatic relief and a tonic effect are about all that can be expected of them, and often the

benefit of one drug soon wears off and its successor is no more fortunate. Creasote is perhaps as much a favorite as any for employment in the cases with foul and excessive sputum.

There have been several reports of improvement from arsphenamine in the bad sputum cases. Perhaps in these cases benefit results from the action of the drug on the spirochætes which are sometimes present. In some instances the favorable response may be due to the presence of an unsuspected syphilis.

Postural Drainage.—Postural drainage has its advocates both enthusiastic and lukewarm. Some patients think more of it than do some doctors. Theoretically the procedure commends itself as it promotes drainage, especially in the basal cases where drainage is most difficult. That it does not effect cures does not disprove its value as a useful adjunct in treatment. By quickly eliminating a large amount of material through proper posture the patient enjoys long periods of relief from cough and expectoration. In addition distinct improvement in the general health is sometimes secured. Patients that have shown no sputum will sometimes reveal it by appropriate postural drainage. Proper instructions will reduce the objectionable features of the treatment to a minimum. Without such instruction the patient may discard the treatment after one or two attempts. The position of the patient that will yield the best results can only be found by experiment. The treatment should be given a fair trial before being discontinued.

Climate.—Of the various types of chronic lung cases that have been recommended for treatment in warm, dry climates none are more generally believed to be benefited thereby than these chronic infective pneumonitis cases when afflicted with copious expectoration. They are apt to do better in any climate when the weather is pleasant and then to suffer from an increase in expectoration in the colder and wetter seasons of the year. Any relief is indicated for these sufferers even if only symptomatic and not curative.

Vaccines.—Some relief from autogenous vaccines is to be looked for in a certain proportion of these cases, but so far brilliant results have not been recorded. On the whole the treatment has been disappointing.

Heliotherapy.—The literature does not furnish much definite information of the value of heliotherapy in these cases. It seems worthy of a trial.

Bronchoscopy.—Treatment by the aid of the bronchoscope has not developed any claims that it is a cure for cases of chronic infective lung disease, but distinct improvement has frequently been obtained in the patient's condition shown by a reduction in quantity and odor of the sputum and in a betterment in his general health. The earlier in the disease the treatment is instituted, the better are the results to be expected from it. Therapeutic bronchoscopic procedures include one or more of the following: (1) Aspiration of the bronchi and any associated cavities, the principle in part being the same as for removing any foreign body. (2) Injection of bismuth in the cavities. (3) Combined injection of bismuth and application of X-rays. (4) Dilatation of bronchi to effect better drainage.

Artificial Pneumothorax.—Artificial pneumothorax, which has yielded some brilliant results in the early stages of pulmonary abscess when the infected area has been sufficiently distant from the pleura, and also in traumatic cases where the air replaces blood-clots in the pleural cavity, furnishes no such promising record in cases of long-standing non-tuberculous infection of the lung where the pleural cavity is normal. The results in no way duplicate those obtained in pulmonary tuberculosis. Some favorable cases have been reported but on the other hand extension of the disease and fatalities likewise have occurred. Successful collapse is not to be expected and does not occur in those lungs riddled with fibroid tissue, which is amply demonstrated by examining such a lung removed from the body. The epithelial lining, when present in cavities, is generally considered a great obstacle to the adherence of the walls and consequent obliteration. When this form of treatment is contemplated, the case should be most carefully studied from every angle, and if decided upon, the air should be introduced slowly and in small amounts and the effects most closely watched.

Thoracotomy With External Drainage.—Operative procedures to be mentioned here, outside of artificial pneumothorax have one of two objectives, one, drainage, the other, extirpation of the diseased area, lobectomy. Thoracotomy with external drainage has yielded

some excellent results in the early period of pulmonary abscess. In the long-standing infective group, however, amelioration of the local manifestations and some improvement in the patient's general health are all that can be hoped for in most cases.

Lobectomy.—Lobectomy, usually only performed in the advanced type of cases, yields a high mortality, even in the best hands and under the most ideal conditions. This risk, however, is often readily assumed by some of these sufferers. Those chronic types of cases come up for consideration who have failed to yield to all other forms of treatment, and whose prognosis is progressively unfavorable without operation. These patients are worn out with long discomfort and distress, they are apt to be febrile and failing in health, the lung lesion may be advancing, and there are usually one or more cavities eliminating, in conjunction with the adjacent involved lung, quantities of foul sputum.

PROGNOSIS

The prognosis of cases of chronic infective pneumonitis has been indicated in what has already been said. Cures, occurring spontaneously, or as the result of treatment, are rarely to be expected. Inhaled foreign body cases offer an exception, for even after years a cure may follow removal of the foreign body. A long and fairly comfortable life, if the patient is properly situated economically, can often be secured, especially if the patient receives the best possible treatment. The worst type of cases have no hope except in a form of operative treatment with high mortality and available to few, a treatment, however, that has yielded some of the most brilliant results known to surgery.

REMARKS ON MYOTONIA À PROPOS OF A CASE OF PARAMYOTONIA LIMITED TO THE ORBICULARIS PALPEBRARUM*

By ALFRED GORDON, M.D.

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MYOTONIA, or tonic spasm of the muscles, presents several varieties with regard to individual characteristics of the spasm, to its distribution and to the mode of onset. It may be congenital, such as the classical Thomsen's disease; it may be acquired (*myotonia acquisita*); or it may be symptomatic in association with other diseases of the nervous system, such as for example *paralysis agitans*. Again, it may be associated with progressive muscular atrophy (*myotonia atrophica*) or *myasthenia gravis*. The chief characteristics of *myotonia congenita* consist of muscular contraction and fixation upon an attempt to execute some movement. This contraction is more or less prolonged, the relaxation of the muscles being gradual. Once the muscles are relaxed, the individual may accomplish his intended act, but any change in the character or in the rhythm of the intended movements, such as a sharp turn or increased speed, may bring on a recurrence of the myotonic contraction. It is evident that voluntary muscular action is delayed. In contrast with this, a reflex excitation of the same muscles will produce an abnormally increased response. Another characteristic feature of the disease is the mechanical and electrical excitabilities. A tap of the tendon is likely to give rise to persistent localized muscular swelling. The galvanic current produces prolonged sluggish contractions with either pole, and if the electrical application is prolonged or else a strong stable galvanic current is maintained, tetanic contractions will be observed at the closure of the anode or of the cathode. Erb also observed under these circumstances wave-like muscular movements from the cathode to the anode. A strong

* Paper read and patient exhibited at a meeting of the Philadelphia Neurological Society, November 24, 1922. I am indebted to Dr. W. Swindells for referring the case to me for study.

faradaic current produces undulatory contractions in the muscles. Another characteristic point of the affection under discussion is that repeated mechanical or electrical stimulation of the muscles decreases and finally exhausts the myotonic reaction. The last characteristic feature consists of a hypertrophy of the involved musculature and of its persistence.

As stated above there are several varieties of myotonia. Among them there is one which deserves especial mention, paramyotonia. It is a form of myotonia in which the symptoms deviate from the classical description, of which Thomsen's disease is the type. Like the latter it may be congenital, but like myotonia acquisita there may be a paramyotonia, acquired after birth. The characteristics of paramyotonia lie in two chief abnormalities which justly or unjustly compelled Eulenberg, Delprat, v. Sölder, Senator, Martins and Hansenmann to isolate it and separate it from the classical myotonia. They are: The muscular spasm is brought on not by voluntary movements—as in myotonia—but by exposure to cold and even to mild cold. The muscular tonicity lasts a long time, even hours. In Case II of J. Rosette's series (*Brain*, Vol. xiv, p. 1, June, 1922) the myotonic reaction of some of the affected muscles was evident only after chilling them. In the fifth case of the same author the myotonic reaction was not only exaggerated in cold weather, but also by a general indisposition, by coryza or by an oncoming menstrual flow.

In some cases published under the title paramyotonia the classical myotonic reaction could not be obtained. These few examples merely prove that the classical myotonia may not always present all the typical symptoms in their entirety, and that there may be encountered variations in the number and in the degree of intensity of the same manifestations; also that the symptoms may vary in different persons and that they may be different in the same person under different circumstances.

In the following case deviations from the classical type will be observed in the original etiology, in the causative factors immediately preceding each attack, in the localization, in the duration, in the mode of relaxation of the affected muscles and, finally, in the electrical response. Whether the affection could be labelled myotonia

FIG. 1.



Patient with paramyotonia, limited to the orbicularis palpebrarum.

acquisita or paramyotonia it is immaterial, but the outstanding feature is an intermittent tonic contraction of certain muscles. In view of the absence of the Erb's formula so characteristic of Thomson's disease, and because of the absence of a muscular relaxation, the case would more properly belong to the category of paramyotonic group.

H. P., male, 52 years of age, painter for 32 years, after undergoing unusual mental stress and anxiety of a domestic character, developed several months ago a spasm of his eyelids consisting of a sudden involuntary closure. At first it occurred only exceptionally, but lately more frequently. The spasm involved at first not only the eyelids, but also the muscles of the forehead. To use his own expression, "they would all become extremely stiff." The attitude of the facial muscles during an attack reminds one of a condition when a burning or an acid substance or a vapor or gas suddenly irritates our conjunctivæ. There is at that time a strong wrinkling of all the muscles surrounding the base of the nose as if one wishes to squeeze out the irritating substance from the eyes. This condition would last many minutes, even as long as ten or fifteen at each attack. The "tightness" of other muscles would leave him first, but the closure of the eyelids would remain much longer. No effort on his part would help to open the eyes: Raising his head, trying to look up from the angles of the orbits, would not in the least degree enable him to remedy the situation during the attack. The closure of the eyes is so firm and the orbicularis palpebrarum is so rigid that no effort on the part of another person could succeed in raising the eyelids. Gradually the patient learned how to shorten each attack. He observed that blowing his nose or else abruptly turning his head for the period of seeing the object of a sudden stimulation or a noise which happened to occur near him, such as a calling out loudly by another person, would enable him to open his eyes and then he would do it promptly without the least difficulty. As to immediate exciting causes of individual attacks, he was unable to give much information with the exception of a suddenly appearing artificial light, which would promptly bring on a spasm. The onset of each spasm is sudden and the termination is also brief, although not sudden. (Fig. 1.)

Mechanical stimulation of the eyelids, such as percussion or a quick tap, produces a prompt contraction and a rapid relaxation of the muscles. The same rapidity of response and disappearance of it is observed also in all the muscles which originally participated in the spasm, namely, in the musculature around the base of the nose, although presently the latter no more contract during the closure of the eyelids. When this mechanical reaction is compared with that of all other muscles of the face or of the body in general, the difference is striking in that the response in the involved muscles is decidedly quicker and more pronounced. Over any other part of the body the muscular reaction is normal. The electrical test with galvanism and faradism at no time gave a myotonic reaction: There was no wave-like contraction seen; there was no tetanic contraction at the anodal or cathodal closing and there was no anodal opening contracture. The faradaic current did not produce undulatory contractions which are habitually observed in myotonia congenita. In this case both currents pro-

duced an unusually prompt response and a rapid relaxation of the muscles. This was particularly manifest when a comparison was made with similar manipulations of all the other muscles of the face.

Further examination revealed preservation of mobility and of all sensibilities in the affected area as well as over the rest of the body. The station and gait were normal. The patellar tendon reflexes were markedly exaggerated, but there was no other abnormal tendon or cutaneous reflex. Ataxia was absent in both the upper and lower extremities. The sphincters were intact. The pupils reacted to light and accommodation. The eye-grounds were intact. The eye muscles were normal. All other cranial nerves were not involved. The mental faculties were intact. There was no suspicion of a neurotic make-up.

The patient's previous history is entirely negative. He never used alcoholic beverages. He smoked moderately. Although he has been a painter for 32 years, he never showed symptoms of saturnine encephalopathy or physical signs of lead intoxication. The urine is free from lead.

Whether or not the continuous mental anxiety and worry predisposed him to the present functional disorder, it is difficult to say definitely.

At present there is some improvement in his condition in that the myotonia is confined only to the muscles of the eyelids. He was placed on frequent doses of strychnine for a period of three weeks with the result that the spasm of the muscles, other than those of the eyelids, has disappeared. Biological tests were all negative.

The case is interesting from several different points of view: While it belongs to the group of myotonia, inasmuch as the muscular spasm is essentially tonic in character, the contractions are only intermittent, the onset is sudden and mechanical irritability of the affected muscles is increased; nevertheless it differs from the classical myotonia congenita in that Erb's myotonic reaction is absent and that the muscular relaxation after an attack is rapid instead of being slow. Another point of interest lies in the localization of the affection. In cases of myotonia and of paramyotonia recorded in the literature at my disposal the muscles of the eyes have been only exceptionally found to be involved, but always in association with other gross muscles of the body. In the present case apparently only the muscles surrounding the orbital cavities were affected, while the rest of the bodily musculature was totally free from spasms during many months of the disorder. The case is apparently unique from this standpoint. It presents an example of an additional variety of myotonia. Although it differs from the other forms enumerated above, nevertheless it belongs to the same great group. All varieties may differ in details as to the onset, mode of termination, exciting cause, mechanical reactions. The essential characteristic feature,

however, namely, the tonic spasmodic contraction intermittently occurring, is invariably present in all forms of myotonia.

The pathogenesis of the affection is still obscure. In the congenital form, especially in cases associated with muscular atrophy, the conjecture may be that one deals here with an inherited abnormality of muscular structure or function, or as Rosette (*loc. cit.*) suggests, with an inherited factor which exerts an abnoxious influence on the neuromuscular system: In one series of cases this factor will produce myotonia with atrophy (Hoffmann, *Neurolog. Centralblatt*, 1906, p. 576; Lannois, *Nouv. Inconogr. d. la Salpêtr.*, 1904, 17; R. Hunt, *J. Nerv. Ment. Dis.*, 1908, p. 269); in other cases only myotonia, and the musculature is spared; in still others myotonia with involvement of cerebral structures, such as in cases of neoplasms of the brain (Bremer and Carson, *Amer. J. Med. Sci.*, 1890, 100, 219). While such a conception of myotonia is logically applicable to its congenital form, the acquired or temporary varieties which occur in middle age, such as in the present case, may not readily find their explanation from it. Schiefferdecker has suggested a distinct disorder of the sarcoplasm and of the muscle fibrils. In this connection one may recall J. R. Hunt's view concerning the two systems of motility, namely, the kinetic and static. He also believes that the motor nerve endings are beneath the sarcolemma and therefore in direct relation with the contractile content of the muscle fibre. The investigations of Dogiel, Huber, and Crevetin have shown the existence of nerve endings of a sensory character in relation to the muscle fibre which are situated outside the sarcolemma, on the outer side of the muscle fibre, in the tendon as well as in the intermuscular connective tissue. Such a conception of a kinæsthetic component of muscle sensibility is applicable to the present case especially in view of a very prolonged exposure to a mineral poison, such as lead during a period of thirty-two years. It is possible that the mental state of the patient coupled with sleepless nights, and maintained during a period of many months, may have predisposed him to an attack of the lead poison and thus rendered him more susceptible to develop a neuromuscular disorder. This would illustrate Hunt's view that the kinæsthetic system is the

sensory component underlying "the twitch," the contractile tonus and reflexes of movement.

Another view on the pathogenesis of myotonia is that of Westphal (*Archives f. Psychiatrie*, 1892, xxiv, 3, p. 918) who considers the affection as a congenital anomaly of muscular tonicity. Seeligmüller believes that it is due to a congenital lesion of the motor tract. Finally, another group of authors (Bernhardt, Strümpell, Ballet, and Marie, as well as Déjerine and Sottas) consider the disease a primary myopathy of congenital origin. Möbius (*Schmidt's Jahrbücher des ges. Med.*, 1883, 198, p. 236) also admits this interpretation, but believes that we are dealing with a systemic affection of the muscles depending upon the nervous system; in his judgment the disease belongs to the group of neuroses. Déjerine and Sottas (*Revue de Médecine*, March, 1895, p. 241) found histological changes in the muscles, namely, hypertrophy of muscular fibres, proliferation of the nuclei and formation of vacuoles in the hypertrophied fibres. Whichever of the pathogenetic explanations we adopt, in the present case, the unsolved element will remain as such with regard to the exclusive localization of the disorder in the muscles of the orbit. Further investigations are necessary in that direction.

PAROXYSMAL HEMOGLOBINURIA *

By DAVID J. KALISKI, M.D.

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THE presence of hemoglobin in the urine has been known to follow the ingestion of, or exposure to, various chemical agents such as potassium chlorate, pyrogallie acid, naphthol, toluylenediamine, phenol, arsenic, etc. It has also been described as occurring in the course of the severe infectious diseases, notably scarlet fever, typhoid fever, small-pox, and in such diseases as malaria and scurvy. In the older literature one occasionally reads of it as a result of the transfusion of the blood of an animal into the human body. It may be said that in recent years following the transfusion of the blood of a donor of a different "group" from the patient this phenomenon has not infrequently been seen. In a series of experimental transfusions performed by the writer in conjunction with Ottenberg and Friedman this phenomenon was regularly observed after the transfusion of large amounts of agglutinable cells into the body of an animal whose serum was lytic for these cells. Iso-hemolysis may be said to occur regularly in test-tube experiments following the incubation of cells and agglutinating serum. The disease has also been described in conjunction with Raynaud's disease and in infants as Winkel's disease. Fatigue and trauma have been described as factors in the production of the disease (Charpentier).

However, I have recently had under observation a syphilitic with paroxysmal hemoglobinuria in which none of the above is a factor. The disease was first described as a clinical entity by Stewart in 1794 although the nature of the pigment in the urine at that time was not known. The disease was referred to as hemoglobinuria by Secchi in 1872, although in 1854 Dressler already pointed out the difference between hematuria and hemoglobinuria.

The disease is a very uncommon one, usually affects men in youth or middle life and those who in a large percentage of the cases

* Paper read and discussed before the meeting of the New York Metropolitan Medical Society, December 26, 1922.

described have had syphilis. Malaria has been alluded to as a factor of importance but a careful review of the literature failed to substantiate the direct etiological relationship between this disease and the type of case under consideration. In sixteen out of Dickinson's twenty-one cases the patients had had attacks of malaria. In six of these there was a history of syphilis. Barratt and Yorke were not able to demonstrate an auto-hemolysin in malarial cases studied by them. Since the use of the Wassermann test for diagnosis Cooke was able to collect thirty-seven cases in which 90 per cent. gave a positive reaction. Stempel obtained 30 per cent. of positive histories of syphilis in seventy-seven cases selected from the literature. In twenty cases reported by Kumagai and Inoue 85 per cent. were syphilitic. While the direct etiological relationship between syphilis and paroxysmal hemoglobinuria has not been established as yet, it is clear that in a majority of the sufferers from the disease syphilis is a factor of unknown importance.

The mechanism of the hemolysis has been described by Donath and Landsteiner to be the following: The serum of the patients with paroxysmal hemoglobinuria contains an auto-hemolysin which unites with the blood-corpuscles in the cold in the presence of complement, causing a laking of the blood, the liberation of the hemoglobin, and its subsequent excretion by the kidneys. As shown by these investigators and adequately substantiated by many others since the publication of their work in 1904, the antibody which is present in the serum unites with the corpuscles only at temperatures close to 0° C. In test-tube experiments, if the serum is separated from the clot and the cells of the patient collected in citrate solution, and after careful washing the cells with saline, if the serum and cells are brought together at 0° C. for half an hour and then heated in the incubator for a few hours at body temperature, laking of the cells occurs. If the cells of the hemoglobinuric patients are first brought together with the serum of a normal individual at 0° C. and then incubated at body temperature as in the first experiment no hemolysis will result. If the cells of a normal individual are incubated under the same circumstances with the serum of the hemoglobinuric patient these cells are promptly laked. If the serum of the latter patient is first heated to 56° C. for half an hour so as to destroy the complement and then the first experiment is repeated

no hemolysis occurs. In other words, complement is necessary for the completion of the reaction. If to the inactivated serum a small amount of fresh serum be added, hemolysis occurs. In other words, we are dealing with an antigen-antibody reaction which is completed by the presence of complement, the antibody sensitizing the cells only at low temperatures, hemolysis occurring at body temperature.

In a small number of cases in which autopsies have been obtained the post-mortem appearances are those of potassium chlorate poisoning. The blood is fluid and dark in color, the spleen is enlarged and the kidneys are filled with granules containing the stromata of cells and blood pigment, usually reduced hemoglobin, hematin. This accounts for the brown and black streaks seen in the substance of the kidney at postmortem. If the anæmia preceding death is very severe the appearance of a severe anæmia is added.

The urine of the patients during an attack is tinted due to the rapid elimination of the hemoglobin through the kidneys. If the attack is a severe one the urine may be black or deep brown; in less severe paroxysms the urine may be the color of red wine. The elimination of the pigment is so rapid that within a few hours and nearly always within six to twelve hours after an attack the urine is amber in color. The urine contains practically no other abnormal elements besides the hemoglobin and some globulin, with the occasional presence during severe attacks of some ghosts of red cells. Spectroscopically the urine gives the lines of oxyhemoglobin if the specimen is examined fresh. If allowed to stand the hemoglobin is reduced to hematin especially in the presence of an acid urine. Urobilin may be present during an attack.

The blood of these patients usually shows the picture as a secondary anæmia due to blood destruction. The more frequent the attacks, the more intense the anæmia. Following an attack or if the blood be taken during an attack phagocytosis of the red cells or of bits of cells by the leucocytes may be observed. The blood-corpuscles may drop from one-half to three-quarters of a million cells to the cubic millimetre within a short time of an attack. According to Bristowe and Copeman, who figured that 341 million corpuscles represent one gram of body weight, the cell loss following an attack is enormous, being equivalent to 4,032,000 million corpuscles.

The paroxysms are usually ushered in by a more or less severe chill caused by the liberation of the hemoglobin from the corpuscles. There is usually an intense thirst, uncontrollable desire to yawn and stretch and occasionally severe pain in the back and loins. There may be nausea and vomiting. In very severe cases the patients may become drowsy, and extremely ill, going into collapse. One case of Easons lost power in his limbs for two hours. The extremities may be cold and clammy, blue and dusky in color. There is occasionally some rise of temperature especially if the attack is a severe one. Urticaria has occasionally been met with, and even purpura and effusions of blood into the joints and cellular tissue. In some cases sweats have followed the rigors as in malaria. Within a short time after an attack the urine is an intense red and remains so for a number of hours when it rapidly clears up. The symptoms of the disease usually rapidly disappear, but if the attacks are frequent enough the anæmia may become very severe, finally causing a lethal outcome.

DISCUSSION

DR. MORRIS MANGES: I have seen three cases of paroxysmal hemoglobinuria but never an autopsy. One loses sight of them for they drift from clinic to clinic and one has no chance to observe them for any length of time. As regards the three cases I saw, two were before the Wassermann came into use, but the one seen since then did not have syphilis. It is interesting to note the relation of syphilis in Doctor Kaliski's case, and if he is given anti-syphilitic treatment it will be interesting to know the result, keeping in mind the idiosyncrasy of the kidney in relation to mercury, given in large doses, by the injection method. If syphilographers would follow up these cases they would be amazed at the results in the kidney following large doses of mercury. One need not be surprised at the marked renal phenomena in regard to mercury, but it is surprising that the enormous showers of casts in the urine after the injections of mercury are overlooked so often. Another interesting thing about these cases is the comparatively slight amount of temperature change required to bring on the characteristic picture. The change can be brought about in the blood in the test-tube by bringing the temperature down to zero; it is curious that this is necessary in the test-tube, whereas in the individual a mere chilling, a slight draft, will bring on the phenomenon. In the fall and winter a slight temperature change is enough to bring on the change in the blood while in summer there is no manifestation.

DR. HYMEN R. MILLER: I would like to ask if there were counts made of the blood-platelets in your case. May I suggest to Doctor Kaliski the possible therapeutic use of hypertonic salt solution for the paroxysm of hemoglobinuria? In the prevention of anaphylactic shock the use of 3 per cent. salt solution has been used by Friedberger to block the mechanism of the complement action and

so prevent the combination of the antibody with its antigen through complement. Perhaps, though of temporary value, the use of hypertonic salt solution may be of service.

DR. BURRILL B. CROHN: I should like to take the privilege of stating that recent studies on paroxysmal hemoglobin showed there was a greatly increased excretion of urobilin within a few minutes after the onset of an attack. The rapid utilization of free hemoglobin and its conversion into urobilin takes place within twenty minutes.

DR. DAVID J. KALISKI: In answer to Doctor Manges about the use of anti-specific treatment causing showers of casts in the urine without albumin, I want to digress to say I have also seen the presence of showers of casts in the urine following the use of iodides alone. I know that what Doctor Manges says regarding the use of mercury is true in rare instances. In the first case in which I saw showers of casts in the urine only iodides were being given, and there was no appreciable amount of albumin. As far as temperature changes causing the paroxysms in hemoglobinuria, one of the patients I saw with this disease came at the time of the draft in the summer and the man had been granted exemption on the ground of bleeding from the kidney. I proved at that time that it was a case of paroxysmal hemoglobinuria. That particular patient had his attacks in the summer-time as well as the winter and syphilis was not a factor, although the literature shows that 80 to 90 per cent. of all cases have a positive Wassermann reaction. Answering Doctor Miller I may say that no platelet examination was made in the case referred to. His last hemoglobin estimation was 50 per cent. There is no fragility of the red blood-cells. As regards hypertonic salt solution, I should think this would have only very temporary value and its use over a long period of time would be impossible for there are other disturbing factors. There is a possibility that the use of calcium salts may have an effect. The first thing that occurs is the union of a hemolytic antibody with the corpuscles at low temperatures (on chilling of the body) and then the liberation of hemoglobin when the sensitized cells reach the warmer parts of the body. The outstanding feature that drew our attention to the fact that my patient was suffering from paroxysmal hemoglobinuria and not inflammation or other lesion of the kidney was his complaint of chilliness in the back, a feeling of fatigue in the muscles, which invariably presaged the coming attack. As far as treatment is concerned, the ideal thing would be to send him to a southern climate in the winter-time, but as this is impossible we will have to make some effort to study the factor that is causing the union of the antibody and cells at low temperature and correct it.

Pædiatrics

EMPYEMA IN ARTIFICIALLY FED INFANTS, WITH SPECIAL REFERENCE TO NUTRITION AND DIAGNOSIS*

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IN artificially fed infants the nutritional upkeep is of paramount importance in health, and becomes doubly so during any acute parenteral infection. Fortunately, in breast-fed infants we are relieved of a great deal of the anxiety of the first twelve months as nature takes care of most infectious conditions by protecting the infant with a natural immunity. Just so soon as the baby is taken off the breast he is deprived of a large percentage of his defense against micrococcal invasion. Then it is that we must be on the alert to combat any infection in its incipency. Respiratory infections, perhaps, rank first among these ills of infancy, and in recent years the frequent complication of otitis media might be included in this group. This type of involvement acts in a twofold manner to lower the infant's resistance, *viz.*, the toxæmia of the infection and the discomfort and exertion of cough incident to a diseased naso-pharynx. Both these latter conditions serve to increase restlessness and insomnia and consequently the lessening of the baby's ability to combat the toxæmia. Fortunately, few of the upper respiratory infections develop into pneumonia, less of these are of the lobar type and far less are complicated by empyema.

It is not given to many of us the ability to treat both surgically and medically these delicate infants whose lives go out so easily following the slightest neglect or oversight. It is so often true that the surgeon is too interested in post-operative care to weigh carefully the nutritional indications, and, on the other hand, the physician is

* Read before the George Washington University Medical Society, December 16, 1922.

not capable of carrying out the operative technic. Therefore, it appears doubly important that the physician should have absolute care of the infant's nutrition and should keep his hands and mind clear of the surgical field. Perhaps this is more important in empyema of artificially fed infants than in any other medico-surgical condition. It is too often the case that the physician feels himself superfluous as soon as the surgeon is called in, when in reality his responsibility has just begun. Uncomplicated pneumonia fortunately is a disease in which nature has limited the duration to a few days and nutrition suffers relatively little. This is not true, however, of the prolonged pleural infections which frequently continue for weeks, causing marked wasting. Thus in an infant who has been deprived of his detoxicating breast milk we find toxic absorption slowly but surely defeating our best efforts. Holt ¹ substantiates this in stating the mortality as 74 per cent. in 74 cases of empyema under one year of age. He does not, however, state that all these were artificially fed and it is probable that the mortality under these circumstances would be higher.

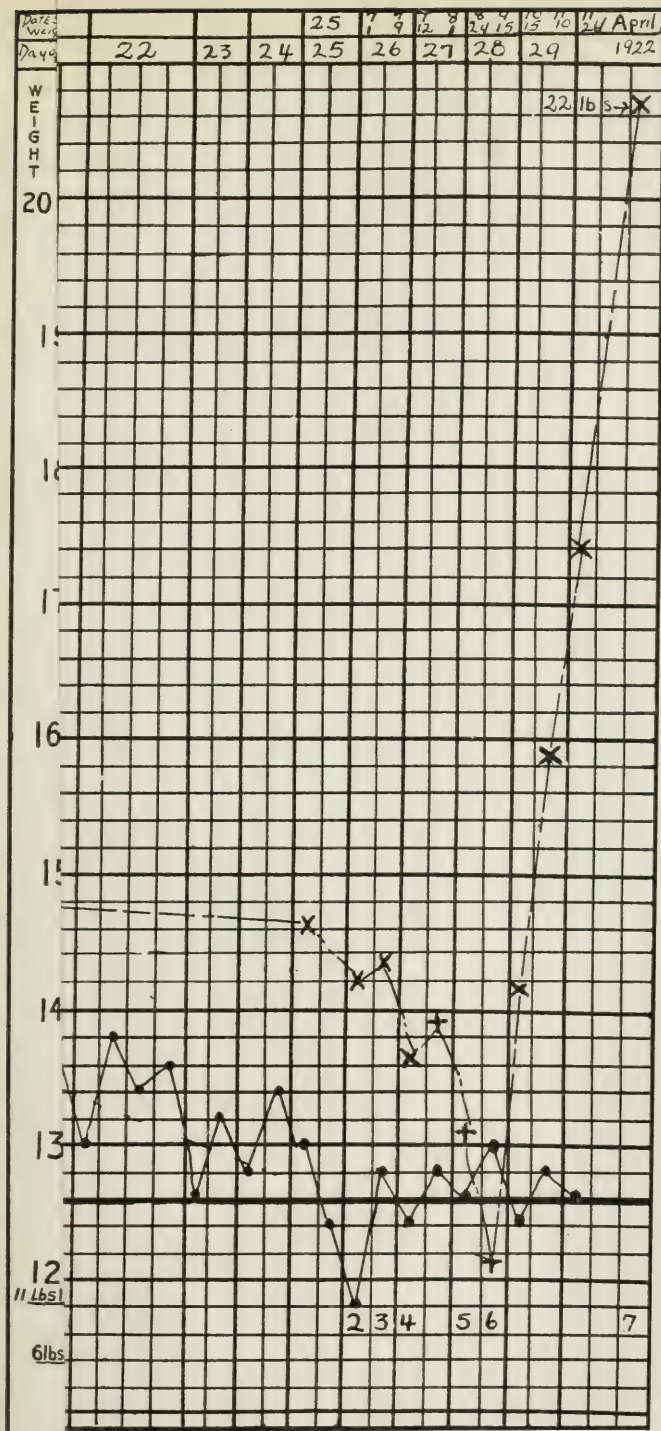
In reviewing the literature of empyema of infants I was unable to find specific reference to those cases in artificially fed infants dealt with in detail. The reports have only referred to them casually.

Most of the authors have contented themselves with the bacteriologic, diagnostic and surgical aspects of the subject, including in their studies both infants and older children. In noting the causes of empyema complicating pneumonia the previous statement concerning immunity to parenteral infections in breast-fed infants should be borne in mind. All writers on infant hygiene bear out this statement and it is used as one of the strongest arguments for maternal nursing. Ludwig Meyer, in his brochure on "Hospitalismus," has shown by a number of illustrative cases the marked influence parenteral infections have on the weight curve of artificially fed infants. Weill and Dufourt,² in a recent article on "Grippe in Children," make the statement that, "One remarks the marked immunity of the breast-fed infant, which is to be explained by antibodies in the mother's milk." The type of pneumonia is the most important single factor in determining our prognosis relative to complications. We know that the frank lobar type is apt to have a greater or less degree of pleurisy

as a sequel. Spencer³ gives 11 per cent. incidence of empyema in 204 pneumonia admissions of all ages up to about seven years. Hodge⁴ states that 90 per cent. of empyemas follow pneumonia, more frequently the lobar type. Foote⁵ has recently called our attention to the neonatal chest of rachitic children, explaining thereby a great part of their susceptibility to respiratory infections. As he further states, these children are much undernourished and have not the ability to expel mucus and inflammatory material from the distal and dependent air vesicles. One might, therefore, assume that the close proximity of this infective material to the pleura produces more or less pleuritis. According to Pybus,⁶ "Empyema in nearly all cases is a complication of pneumonia, the infection of the pleura being by direct extension of the inflammation."

CASE I is that of Baby W., born of healthy parents, birth-weight 6 lbs., 14 oz., nursed for 5 months, weight 11 lbs., 15 oz. The baby was then put on a modified cow's milk formula but there was not a satisfactory gain in weight. Coincident to the artificial feeding he developed constipation, frequent attacks of colic, and a rather marked secondary anæmia. When seen some 21½ months later, at the age of 7½ months, his weight was 14 lbs., 14 oz., there was a secondary anæmia, while constipation and flatulence were troublesome symptoms. He was then on a rational formula for a child of his age and weight, but there was not the proper metabolic reaction. The stools were large, pasty and grayish-yellow in color, frequently containing fat-curds. The odor was distinctly foul, as of undigested fat. Attempts were made to correct these symptoms, but just so soon as the formula was increased sufficiently to satisfy his hunger there would occur an attack of fat indigestion with loss in weight. Consequently, little progress was made in improving his general condition though there was a slow, progressive increase in weight. (Chart I.)

Beginning about the first of May, 1921, there occurred mild, but repeated, attacks of rhino-pharyngitis accompanied by aural inflammation continuing to the onset of his acute illness. On May 25th the temperature was 100° F., with a muco-purulent nasal discharge. He took his formula well, but the stools were pasty and foul. Weight 15 lbs., 10 oz. May 27th, temperature 99° F., nasal discharge same. Stools pasty. May 29th, temperature 101.6° F., rest-



CASE 11a; (E), empyema; rib-resection. (1), malt soup; (2), loss of 1 lb., 6 oz.
 spinal: transfusion; (7), complete recovery, 22 lbs., aged 20 months.

less, sleeps little. Cries and frets a great deal as if in pain. Takes formula poorly; nasal discharge continues. Few mucous râles were found in chest; abdomen distended, but relieved by enema with passage of large pasty, foul stool. Both ear-drums congested; incised with evacuation of sero-sanguinous fluid. May 31st, temperature 99° F. Appears more comfortable, does not look so ill. Nasal discharge less. Thin, yellowish aural discharge. Weight 15 lbs., 12 oz. Stools better. June 2nd, temperature 102.4° F. Child restless, crying and fretting. Mother states ears have "ceased to run." Chest shows occasional mucous râles. Both paracenteses closed. Ears reopened with escape of thin yellow pus apparently under pressure. Weight 15 lbs., 8 oz. Taking formula poorly; stools foul. During the next two or three days the temperature remained elevated, the ears discharged freely, and there were signs of a generalized bronchitis. June 6th, temperature 103.5° F. Respirations labored. The child looked acutely ill. Both ears draining sufficiently. Bronchitis much less. There was an area of consolidation about three inches in diameter below the angle of the right scapula occupying approximately the position of the upper portion of the right lower lobe. During the next few days the temperature remained up. He took his formula well, though distention was troublesome which necessitated frequent enemas for relief. The stools were not at all good and continued to show poor fat assimilation despite changing in every way possible the fat, carbohydrate and protein ratios. The pneumonic process gradually involved the whole lower lobe and hence its resolution was slow, corresponding to the lysis in the temperature curve. This gradually dropped to 100° F. with intermittent elevations to 102° F. Following two days of this irregularity of temperature, from June 15th to 17th, the child was definitely more ill than during the previous three or four days. On June 18th the temperature was 102.6° F.; respiration shallow, labored and accompanied by an expiratory grunt. The infant looked seriously ill. The face was anxious, the eyes wide and bright. Examination of the chest showed a short, jerky respiratory movement, somewhat less marked on the right posteriorly. Percussion revealed a slight auditory dullness over the right lower lobe posteriorly from the angle of the scapula downward, bounded laterally by the posterior axillary line.

There was a definite feeling of flatness over this area as contrasted with the vibratory sensation on percussing a normally resonant chest. The stethoscope did not add to the findings since the breath sounds were fairly loud and accompanied by the large râles of a resolving pneumonia. X-ray substantiated these findings, and on aspiration through the eighth interspace a thick, greenish-yellow pus was obtained, showing a pure culture of *Pneumococci*. Under local anæsthesia the closed method of drainage was attempted, but was unsuccessful on account of the close proximity of the ribs, and rib resection was resorted to. There was rather marked toxæmia for two days more, though frequent evacuations and irrigations of the cavity were made. Following this the temperature gradually subsided, but anorexia and abdominal distention with poor digestion continued. However, on July 1st, twenty-five days after the acute onset and thirteen days post-operative, his weight was 14 lbs., 4 oz., a total loss of merely 1 lb. and 6 oz.

During the time from June 15th to July 1st the diet had been a malt soup mixture, but the weight loss had been progressive. He was then put on a skimmed milk mixture with cereals, beef juice, egg yolk, and gelatine with a gain in weight of three ounces over a period of eight days.

On July 10th, due to a misunderstanding between the nurse and mother, he was given one 8-ounce bottle of whole milk which undid everything that had been accomplished the previous week. This one bottle of whole milk (fortunately the mistake was discovered before a second was given) produced a diarrhœa with a loss of 13 ounces in the next 48 hours. Protein milk was necessary because of the marked fermentation which resulted, the child remaining on this until the family were compelled to go North on August 1st, the child weighing then 13 lbs., 15 oz., a gain of five ounces in three weeks. The effect of the digestive upset had been overcome as evidenced by normal stools and his increased vitality and generally healthy appearance. The operative wound had now healed and a speedy recovery was anticipated. The subsequent history showed the mother's anticipation to be short lived as a change was made to a whole-milk formula shortly thereafter, and the child again lost rapidly to 13 lbs. and 3 oz. The mother then took the child to a hospital where he finally

recovered. Three weeks after his admission, following a gradual loss in weight to 12 lbs., 4 oz., he was given a transfusion of 180 c.c. of blood. Rapid improvement occurred and on September 28th, 13 days later, he weighed 13 lbs., 10 oz., a gain of practically a pound. On October 15th he weighed 14 lbs., 2 oz.; October 29th, 15 lbs., 2 oz.; November 10th, 15 lbs., 12 oz.; and on November 26th, 17 lbs., 6 oz. Following this there was a continued improvement, and in April, 1922, at the age of 20 months, this child weighed 22 pounds and was apparently well except for retardation in development. He was running about as other children, his color was excellent, there were 14 teeth, the chest was symmetrical and showed very little pleural thickening. It was necessary, however, for the mother to watch carefully the fat intake, so some articles of diet containing large amounts of fat were still omitted.

CASE II is that of Baby A, six months old, born at full term of healthy parentage. He was nursed one month and was weaned on account of phlebitis in the mother. The mother put the baby on condensed milk which he was still taking when seen on March 17, 1922. He weighed at that time 11 lbs., 8 oz. Though he looked fairly well nourished, the musculature was very flabby, there was marked anæmia with the typical appearance of a "condensed milk baby." The temperature was 102.4° F., the child was crying as if in pain and was rolling the head from side to side. There was rather a profuse muco-purulent nasal discharge, a mild degree of bronchitis and both ear-drums were bulging. Paracentesis was done with evacuation of a large amount of pus. Despite active treatment and free drainage of the ears the temperature remained up and on the second day a definite pneumonia was present in the right lower lobe. The temperature continued elevated and on the fourth day the infant appeared much worse; the respiration was increased, shallow and labored, and accompanied by an expiratory grunt. The color was bluish-gray and perspiration was rather profuse. There was marked dulness and tactile flatness over the lower chest posteriorly. As usual in these cases the auscultatory findings were practically the same as on previous examinations. Exploratory puncture revealed greenish-yellow pus. Rib resection was done under local anæsthesia, the cavity emptied and irrigated with salt solution. Recovery was

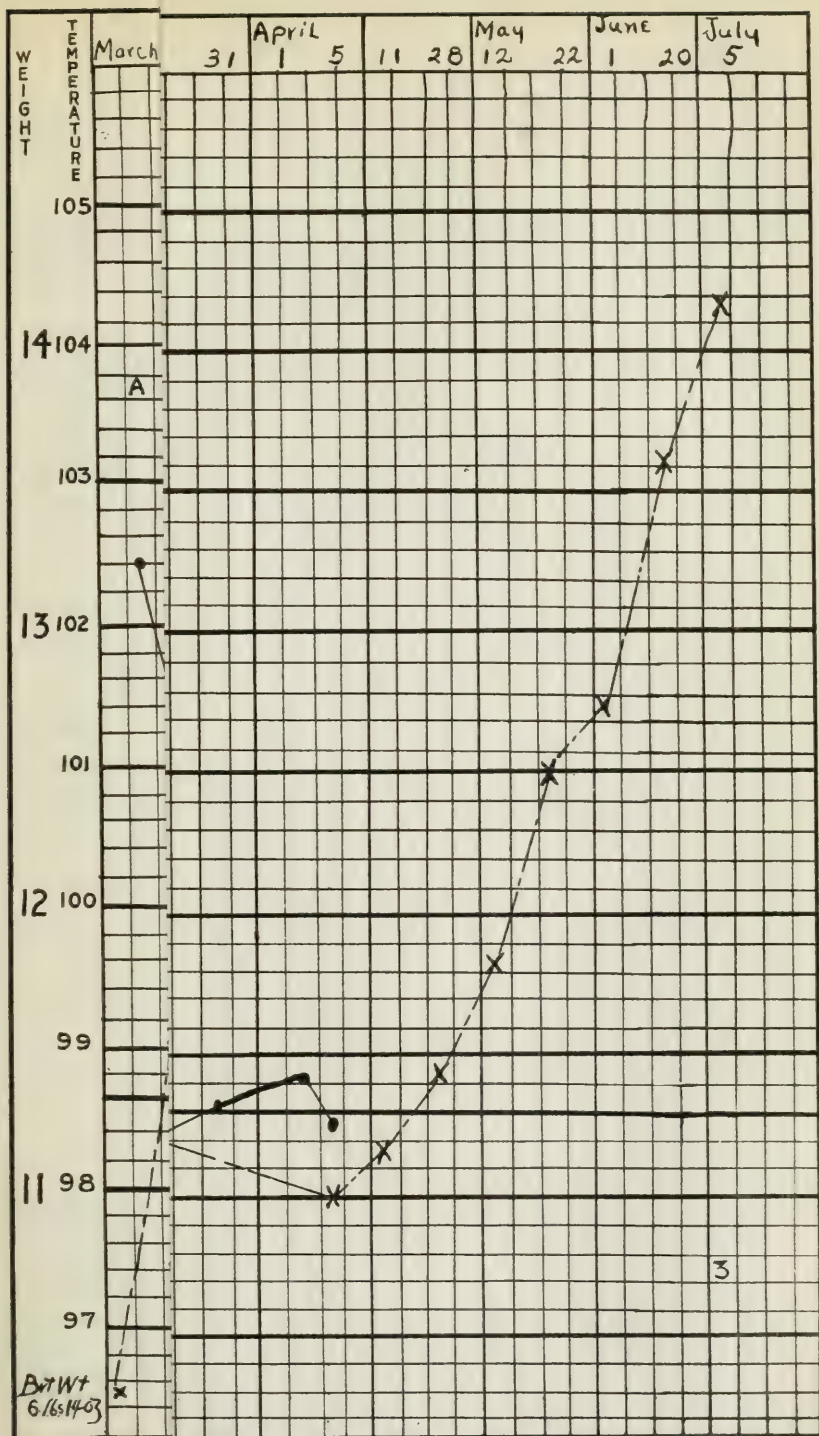
rapid, the temperature reaching normal on the seventh day and the wound healing on the fourteenth day. (Chart II.)

During the acute illness the child was left on condensed milk as he took, and apparently assimilated it, very well. The temperature reached normal on the seventh day post-operative, and on the fifth day post-operative he was given a fresh cow's milk formula and orange juice. His weight gradually decreased and when discharged from the hospital nine days post-operative and fifteen days after the acute onset he weighed 11 lbs., a loss of 6 oz. However, the weight soon began to increase and three weeks later it was 11 lbs., 7 oz. Three months afterward the child weighed 14 lbs., 2 oz., and appeared well in every way, though of underweight and poorly developed. The chest was symmetrical, and showed very little evidence of pleural thickening.

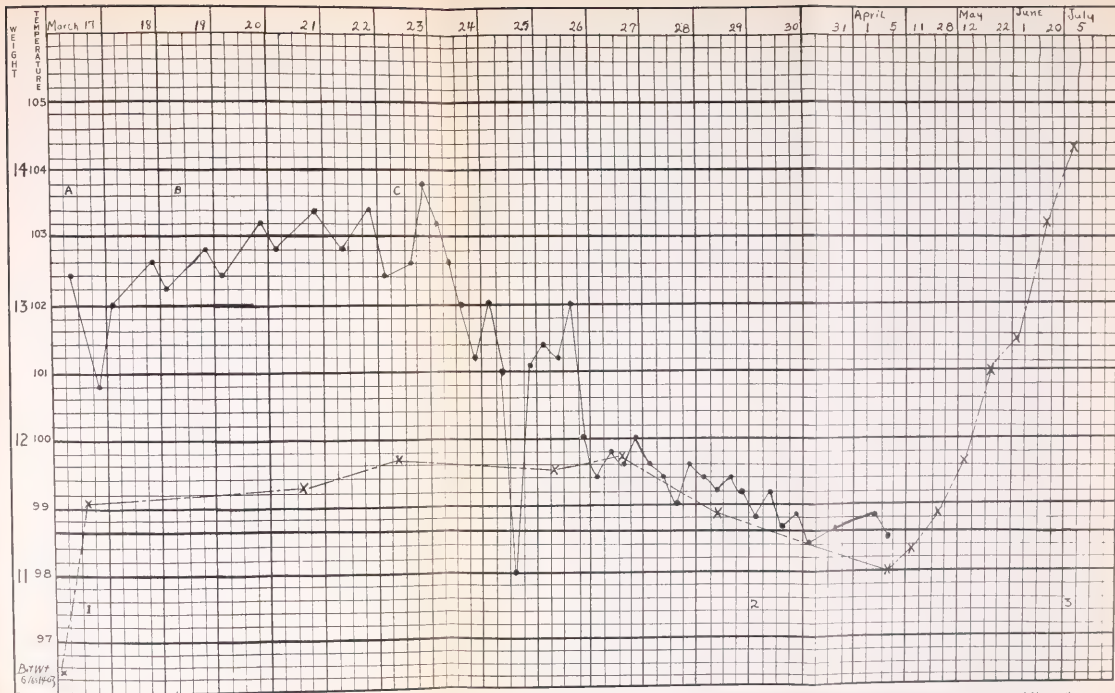
Both these cases present rather typical diagnostic points which should be looked for in all cases of pneumonia where the symptoms do not abate promptly. These signs may be briefly noted as follows: (*a*) Persistent or fluctuating temperature; (*b*) increased respirations of a shallow and labored type accompanied by an expiratory grunt and asymmetrical chest movements; (*c*) anxious or pinched facies and a grayish-blue complexion frequently referred to as ashy; (*d*) excessive perspiration; (*e*) tactile flatness on percussion with little or no change in the auscultatory findings. Perhaps the most important of all these is the latter. Heart displacement and Grocco's sign, so frequently referred to, has not been a prominent feature of the cases which I have seen, even in older children, since both of these depend on a more or less large accumulation of fluid and are usually seen in left-sided empyemas.

The treatment of these cases of empyema is as important medically as surgically as exemplified in Case I. Rib-resection seems to me to be indicated on account of the narrow intercostal spaces. It is likely that a number of poor results may be explained by poor drainage, due to pinching the drainage tubes between the ribs.

Pus retention and toxic absorption cause marked wasting in infants, especially those artificially fed, hence, careful watch should be kept over the nutrition. Water balance should be retained by forced fluids between feedings and hypodermoclysis when necessary.



CASE II. w's milk formula and orange juice; (3), recovery, aged 9½ months.



CASE II Baby A — Temperature indicated by •—•, weight, by X—X. (A), rhino-pharyngitis, otitis media paracausalis, (B), pneumonia, (C), empyema. (1), condensed milk, (2), cow's milk formula and orange juice, (3), recovery, aged 9 1/2 months.

On account of the rapid tissue waste the feeding should be relatively high in protein, while the fat is rather low. These little patients apparently do not have a normally high fat tolerance. Carbohydrate seems to be well borne, and the sugar intake should be supplemented by starches in older infants. This is demonstrated in Case II when condensed milk was given during the acute illness with an actual gain of six ounces. Of course, it is needless to say that breast-milk on account of its detoxicating qualities, in addition to being an otherwise ideal food, should be used whenever available.

The conclusions to be drawn from these two cases and our knowledge of the reaction of artificially fed infants to pus infections may be briefly summarized as follows:

- (1) Artificially fed infants are more prone to parenteral infections than those who are breast fed.
- (2) So-called lobar pneumonia precedes emphyema in the great majority of cases.
- (3) During pneumonia a co-existing suppurative focus elsewhere, as in the ear, increases the possibility of an emphyemic complication.
- (4) Tactile flatness is the most important single sign in diagnosis.
- (5) Aspiration should be used rather than X-ray to determine the need of operation.
- (6) The previous nutritional condition and the infant's tolerance to the food principles should be carefully analyzed.
- (7) These cases are problems of nutrition as well as of surgical treatment, and the physician should handle them accordingly.
- (8) Breast-milk is the ideal food.

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FOUR CASES OF MUSCULAR DYSTROPHY*

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CASE I.—This boy, five years old, shows well-marked characteristic of pseudohypertrophic myopathy. There is beginning atrophy of both pectoral groups. The quadriceps extensor groups are prominent, calves enlarged, notably oval in outline, these changes in size being sufficiently marked to evidence deformity.

There is no history of familial muscular defect. Family history is negative for evidence of nervous disease or other developmental anomaly. Birth, full term; first teeth at ten months; talked at one and a half years; walked at fifteen months. When two and a half years old it was noted that he had difficulty in walking. Progress slow and he fell frequently. With increasing size there was decreased power in these muscular groups already noted. He climbed stairs with difficulty. He fell in walking and running; had uncertain equilibrium. His attitude in standing is characteristic. There is marked lordosis. Feet are planted widely apart; there is a waddling gait, feet are lifted high to avoid stumbling. His "toe" gait helps in maintaining balance. His eyes directed to the ground indicates concern as to equilibrium. He violently impacts against chair or floor in the insufficiently controlled movements necessary to change from standing to sitting posture. To rise from sitting or lying position he turns to an "on all four's" posture upon the floor, then elevates his trunk by continuous crawling with his hands up his shins and thighs to the erect posture. Marked weakness contrasts with the evident oversize of his muscles.

CASE II.—This male child is six years old. The family history in this case is notable. His maternal grandmother had two brothers showing muscular dystrophy; two uncles, maternal, each have two children (boy and girl each) giving no evidence of this disease. An

* Patient presented before the Section on Pædiatrics, New York Academy of Medicine, May 11, 1922.

aunt, maternal, has three children, two girls and one boy. The boy has a condition of non-hypertrophic dystrophy affecting the lower extremities. In his immediate family there are three children, an older sister, perfectly well, and a brother, 13 years old, who for some years has shown myopathy of the Landouzy-Déjerine type. The familial transference through female members though they themselves are unaffected is in this history evidently expressed.

This boy was born at full term, talking at 14 months, walking at 1½ years; has shown symptoms since his third year. First noted difficulty was in walking; he fell rather frequently, had difficulty in getting up, sat down with violence, and was easily fatigued. He shows almost identically similar muscular changes with those noted in the preceding case. There is the same standing posture, waddling gait, the precipitate violent movement in sitting, difficulty in rising, and characteristic "climbing up" movement. He walks with knees well lifted, and his eyes fixed upon the ground to make sure of safe progress. There is beginning wasting of the pectorals. No other group seems affected.

CASE III.—This boy is nine years old. His family history is negative and the early account of him presents no symptoms presumed to be related to this condition. At six years he showed lessening general muscular activity, and was thought to be physically weak. A photograph taken at this time in standing posture evidences no obvious defect. He began, however, to play less vigorously, fell frequently, and later had difficulty in walking. His described posture and muscular movements would indicate weakness in the calf and anterior thigh group of muscles. Later, weakness and atrophy in the shoulder girdle and upper arm group and muscles of the back began. Weakness and wasting have been progressive and deforming contractures are evident at the knees, right foot and right elbow. The shoulder girdle and back muscles are markedly atrophic. These contractures, apart from muscular weakness, prevent standing and limit movements in their respective foot and elbow. Besides this particular myopathy there is wasting, generally from muscular disuse. His hands lie upon his thighs and he approximates his left mobile upper extremity to his head only by sliding the hand along thigh, waist, shoulder and neck, finally by this crawling effort reaching the

vertex. Fatigue easily ensues and after a few efforts he is unable to accomplish this. All shoulder and back muscles are pitifully wasted, there is no muscular fixation of the shoulders and you mark how limply he slips between my lifting hands. He shows the disability of contractures and the extreme wasting of this progressively atrophic disease. There is no evidence of a preceding hypertrophic stage.

CASE IV.—This boy is thirteen years old and gives no family history which bears upon his condition. He walked late, talked at 14 months, his difficulties in locomotion were observed somewhere between the eighth and tenth years. He was unstable in equilibrium, walked upstairs with difficulty, fell frequently. At the age of ten years he fell and broke his right femur. He was for two months a patient in St. Mary's Hospital and when convalescing was sent to Convalescent Hospital in White Plains. While there he fell again, breaking his femur at a point slightly distal to the original break. He remained in that institution six months. His disabilities have gradually increased and he now presents these obvious marked deformities resultant of muscular weakness and disuse. There is both excessive hypertrophy and pitiful wasting. There are some contractures. You will note that his head is large, frontal bosses are prominent, teeth widely spaced, and the lower jaw is large. The features are generally heavy suggesting acromegaly. The spine is twisted, abdomen is prominent, and he has wasting of all the muscles of the shoulder girdle, trunk and arm. The muscles of the forearm are only slightly atrophied. The hands show moderate muscular wasting. The quadriceps and extensor groups are excessively large and have a peculiarly hard feel. Attempted use of these muscles gives impressive evidence of their lack of power.

X-ray of the femur shows his old fractures. Thinness and attenuation of the bone and poor muscular ridging are evident. He can not put his hands upon his head and has only limited movement of the arms. He is unable to stand. Attempts to lift him by the shoulders bring the angles of the scapulæ in actual contact and as the term goes you note that "he slips between my lifting hands." His is a progressive dystrophy with a marked condition of resulting distortion.

This brief clinical presentation allows of a summary of only the common outstanding features. All the subjects were of one race—

Italian. All are males. In all but one in certain groups of muscles there is marked hypertrophy as one phase of the myopathic process.

All show a low point of sugar metabolism, the average for the four cases being 73.3 mil. of sugar per 100 c.c. of blood. Cranial X-rays present in all a relatively small sella turcica. Long bones have shown slender construction, attenuated small muscular ridging. All Wassermanns were negative. Reflexes over the affected muscles are sluggish or absent. All the eye-grounds are normal. The processes were noted for early beginning and the muscular changes are steadily progressive. Little is known as to the causation of the disease. A presumption of endocrine disturbance seems plausible.

GANGLIONEUROMA OF MEDIASTINUM*

By WILLIAM ROSENSON, M.D.

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THIS little girl, aged eight years, came to the Mt. Sinai Clinic in January, 1922, complaining of a cough of one year's duration. The mother had had three other children, one of whom died of pneumonia; no miscarriages. The patient's birth-history was normal. She had measles at eighteen months, whooping cough at six years. Her development was normal.

Present Illness.—For the past year she has had persistent cough with intervals of moderate, irregular fever; progressive weakness and loss of weight; occasional vomiting; no night sweats. She had been in another institution for the same condition four months previously.

Physical examination showed a small markedly undernourished child, weighing 40 pounds; pale, with a short hacking cough at frequent intervals. Examination of the chest revealed flatness on percussion over the entire right side. The breath sounds were markedly diminished and particularly at the angle of the scapula there was distant bronchial breathing. Fremitus was absent. The left chest was normal. The heart was displaced only very slightly to the left. The sounds were good, there being no murmurs.

The X-ray report stated that the chest showed an encapsulated effusion which occupied the region of the right upper lobe extending to the third rib anteriorly. There was also an unresolved pneumonia at the right base.

The von Pirquet test was negative.

The blood count showed W.B.C., 11,500; polymorphonuclears, 90 per cent.; lymphocytes, 10 per cent.

The urine examination was negative.

* Patient presented before the Section on Pædiatrics, New York, Academy of Medicine, May 11, 1922.

The patient was admitted to the hospital service of Doctor Heiman. On aspiration of the right upper chest two c.c. of bloody fluid were obtained. Smears showed intracellular Gram positive cocci, but there was no growth from the fluid. The patient was then transferred to the surgical service for operation. Doctor Lilienthal performed the operation. He made a small incision in the right upper chest and aspirated, but nothing was obtained. He then enlarged the incision, resected portions of the fifth, sixth and seventh ribs posteriorly, near the spine, and made an extrapleural approach. On inspection he saw a large tumor mass the size of a tennis ball in the upper right posterior mediastinum; underneath this and attached to it was a smaller mass, the size of a small orange and crescentic in outline. The condition of the patient became very serious, she being pulseless and showing symptoms of shock. Doctor Lilienthal was therefore able to excise only the smaller part of the tumor at this time. A week later, the condition of the patient having improved sufficiently to permit of a second operation, through the same opening, the large tumor was readily removed.

The pathological report by Doctor Mandelbaum stated that the growth was a ganglioneuroma. This type of tumor is composed of ganglion cells and nerve fibres. It is derived from the sympathetic system. It is a form of growth which is very rare, and especially so in the thorax. Ewing mentions two cases, described by Loretz and Borst, of subpleural tumors lying near the spinal column.

Since the operation the child's general condition has improved, the cough has considerably diminished. She has become stronger and her weight has increased, being now 44 pounds. While in the ward she developed an unusual eye condition, which was noted by the ophthalmologist, Doctor Wulff. The right palpebral fissure was smaller than the left, due to a ptosis, the right pupil smaller than the left, and there was an exophthalmos of the right eye. This is Horner's symptom-complex, and is due to an involvement of the sympathetic nerve.

The case is presented because of the rarity of the tumor and to show the possibility of its removal.

Gynæcology and Obstetrics

PRACTICAL HINTS FROM OFFICE EXPERIENCE IN GYNÆCOLOGY

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THE literature of gynæcology, for the most part, consists of technical descriptions, often beautifully and profusely illustrated, of proposed new operative procedures or modifications of old ones, which, it is hoped, will immortalize the surgeon's name, but which generally fade quickly to ultimately entirely disappear into the limbo of surgical follies; or, on the other hand, of learned expositions on the physiology and pathology of the various morbid conditions to which womankind is heir, which generally overshoot the mark, so far as the intelligence and professional knowledge of the average practitioner of medicine is concerned, and, therefore, are limited to the mentally *élite* of the profession—a small group, at the very best. It is rare, indeed, to find a paper devoted to the more practical side of office work in gynæcology which will appeal to the average medical man; yet such a paper should be eminently useful. It is in an endeavor to meet this want, no doubt, that I have been asked to contribute such an article at this time. As I must plead guilty to having been one of the surgical or pathological offenders just mentioned, a paper of this nature will be to me, as to others of this class, more or less of a novelty. There are, however, a number of problems that are encountered by every gynæcologist which often are perplexing and difficult of solution, but which are of extreme practical importance. It is my purpose to give here merely my personal experience in two or three such matters, with the hope that this may be of some value to others in the practical solution of their problems.

LEUCORRŒA

Uterine catarrh is the commonest disease of womankind. I will be within the bounds of safety, I think, when I state that every woman will, at some time between puberty and the menopause, suffer from this disease in varying degrees of intensity. Its main, if not its only, symptom is a discharge, more or less profuse, of a mucopurulent nature, at times acrid and irritating and occasionally malodorous. So common is this symptom that it has become popularly known among the laity as "female complaint."

Many conditions are put down in the text-books and current literature of gynæcology as the etiological factors of uterine catarrh—which may be confined to the cervix uteri alone or may also involve the body or corpus uteri; but when the matter is resolved to its ultimate factor it is recognized that the disease is nothing more nor less than an infection. The infecting germs having gained access to the deeply implanted racemose nabothian glands of the cervix or the equally deep-seated tubular utricular glands of the corpus uteri, it becomes an exceedingly difficult matter to eradicate them and effect a cure of the disease. Indeed, there is a group of gynæcologists who regard endometritis generally, and certain forms of the inflammation specially, as incurable and make no attempt whatever to treat them. I am not in sympathy with this view. On the other hand, I fully believe that each variety of endometritis is amenable to treatment of the proper kind when properly applied.

The actual pathogenic causal agents of endometritis may be various species of staphylococci, the tubercle bacillus, the gonococcus of Neisser, or other pus-forming organisms. These act upon a pre-existing tear of the cervix, a subinvolved uterine mucosa, some neoplasm of the cervix or body of the uterus, a passive congestion of the mucosa due to uterine displacement, menstrual disturbance or some other predisposing condition—and the trouble begins. The most common acute cause of the infection is the entrance of gonococci or the introduction of staphylococci at or immediately after a childbirth or a miscarriage. Once started it does not take long for the primary acute infection to subside into the subacute or chronic form of the disease, which then may persist indefinitely if not energetically

combated, and which has by this time become a mixed infection, numerous pyogenic organisms being present in the discharge.

Sooner or later, if this condition remains untreated, the so-called erosion of the cervix will develop. This erosion may be slight in extent or it may be so extensive as to involve the entire outer surface of the portio vaginalis, which becomes an ulcerated surface covered with unhealthy granulations. In gonococcal infection these granulations may lie entirely within the cervical canal without any apparent erosion; they then give rise to a serosanguinolent discharge. In such cases the granulations may be detected by passing a sound or applicator, wrapped with dry cotton, as far as the internal os, or if this be patulous, as far as the fundus uteri. If this is blood-streaked when withdrawn it is sufficient evidence that the granulations are present in the canal.

The primary step in the treatment of leucorrhœa must be the correction of the erosion, if it be present, and the removal of the granulations. A long experience with silver nitrate and the other silver salts has taught me the practical uselessness of these remedies. In fact, I have in recent years limited myself for this purpose to the use of 95 per cent. carbolic acid without the after-application of alcohol. The carbolic acid should be applied directly to the granulating surface wherever it is found, and the acid should be carried clear to the uterine fundus if the internal os is patulous. By no means should a closed internal os be forced open, since the very fact that it is closed indicates that the morbid condition is limited to the cervical canal. The removal of the unhealthy granulations gives free access to the infected tissues beneath them for any curative agent that may then be employed.

The non-specific infections are best treated by the carbolic acid alone, or by applications of the old, well-known Battey's solution, which consists of equal parts of Churchill's tincture of iodine and 95 per cent. carbolic acid. Tampons should not be used; they are frequently a source of reinfection and are an uncleanly method of treatment at the best. For the leucorrhœa of young girls in whom the hymen still persists, cleansing of the external genitalia daily with glycothymolin, alkalol, or other antiseptic agent, or with sterile

water, and the employment internally of a preparation containing tincture of the chloride of iron, ten minims, and tincture of cantharides, one minim, to the dose, will often give gratifying results. In the non-specific vulvo-vaginitis of little girls, in addition to the local treatment by cleansing applications to the vulva and vestibule and the injection by means of a medicine dropper or a small syringe of sterile vaginal douches, the patient should be given internally five to ten drops of the syrup of the iodide of iron three times daily after meals.

The gonorrhœal cases of uterine catarrh have been the *bête noir* of the profession, and many gynæcologists have abandoned their treatment of these patients in sheer disgust at their failure to obtain satisfactory results. This, I claim, is a mistake. The failure has been caused by a wrong conception of the condition or by the use of comparatively useless remedies improperly applied. After passing through the same bitter experience as that noted by every other gynæcologist, I have, for the last seventeen years, been confining myself to the employment of but one remedy in female gonorrhœa, and with most gratifying results as compared with those obtained from other lines of treatment.

Gonorrhœal cases, when prepared by the preliminary use of carbolic acid in the strength above mentioned, can be quickly relieved in most instances by the *local* use of a 1 per cent. aqueous solution of methylene blue applied copiously to the affected part from the fundus uteri to the vestibule. Not only does a prompt amelioration of the symptoms follow in these cases, whether acute or chronic, but repeated microscopic examinations show a rapid diminution with ultimate complete disappearance of the specific germs. Moreover, the blue meets all the requirements and possesses all the attributes of a useful and effective gonococcocide in that it is eminently gonococcidal in the strength mentioned, it is non-irritating to the tissues, and it penetrates deeply into the tissues without destroying cell-activity. I wish especially to emphasize the uselessness of the remedy when administered internally. The number of gynæcologists who are adopting methylene blue in the treatment of gonorrhœal infection of the genital tract below the fallopian tubes is rapidly increasing,

and their reports concerning the success obtained is gratifying, to say the least. In little girls the blue should be injected into the vagina by means of a small syringe.

It stands to reason that surgical gonorrhœa is not included in this class of cases. Gonorrhœal salpingitis and infection of Bartholin's glands will be best treated by the appropriate surgical methods in general favor. The same is true of those rarer cases of tuberculous endometritis and the few cases of senile endometritis terminating in pyometra, both of which conditions necessitate removal of the uterus.

CONSTIPATION

Foremost in the list of feminine complaints encountered in office practice should probably be placed varying degrees of intestinal stasis. Goodell's definition of woman has now gone down among the classical dicta and famous traditions of medicine. "Woman," he said, "is a constipated biped." He further believed that a good purge would relieve more than 50 per cent. of those women applying to physicians for help—that is, would give a symptomatic cure—without the necessity of resorting to further medication. Laxatives, purgatives and cathartics undoubtedly have their place in legitimate gynecologic practice, but their use should be restricted as largely as possible and should not usurp the preferable methods of regulation of the bowels by the adoption of carefully selected diets, the observance of proper hygiene, the performance of daily exercise of various appropriate kinds, and the cultivation of the normal body reflexes.

Of all the pernicious habits into which the body may fall, probably none can be more readily contracted and developed than the habit of constipation. Failure to attend to the call of nature when it comes, or to cultivate a regularity of such calls by insisting upon a daily evacuation of the bowels at a fixed time, as immediately on rising or shortly after breakfast, is to be blamed in most instances for the development of the constipated habit. Nor should the bare statement of the patient that she is regular in her bowel-movements be accepted conclusively without further investigation. I once asked one of my clinic patients if her bowels were regular—a form of the question that I do not usually adopt—and was assured very emphati-

cally that she was quite regular in this respect. I then inquired if she had a daily bowel-movement. "Oh, no!" was the answer. "How often do you have a bowel-movement?" I asked. "Once every two weeks!" was the nonchalant reply. Two bowel-evacuations in a month! Twenty-six in a year!! And yet this patient called herself regular! This is the most marked case of constipation that I have ever encountered; but there are many women who have but one evacuation of the bowels per week, and still many more who will run three or four days before relief is obtained by artificial means.

In treating these patients I always insist upon the use of laxative foods, as the coarser cereals, bran, whole wheat and rye bread; foods with bulky waste; and laxative fruits, as a primary fundamental. Then, I instruct the patient how to adopt certain of the so-called "setting-up" exercises which are in general use in the army. These, by calling into play the various muscles of the back and abdominal walls, tone these muscles up to such a degree that by their tonic contraction the bowels are compressed and peristalsis is stimulated. I resort to laxatives and purgatives as little as possible, and when I do make use of them I select those which I believe to be least irritating and most effective in counteracting the basal condition. These include mineral oil, sweet oil, the various cascara pharmaceutical preparations, and certain well-recognized laxative pills including the old compound cathartic pills and the widely used A B S, Hinkel, and Lady Webster dinner pills.

There are other methods of treatment, however, which I much prefer to adopt, and of these I especially favor two, namely, a toning-up or stimulation of the involuntary muscles of the intestinal walls, and a development of the anal or rectal reflex.

It is well recognized that in many clinical cases a depraved state of the involuntary muscles of the body exists, or a condition of apathy to stimuli of any kind. This is just as true of the intestinal canal as it is that there are certain individuals who are essentially non-responsive, dull and apathetic to emotional stimulation. Likewise, we have all, doubtless, met the so-called apathetic uterus which resists every known stimulus to contraction and passively submits to gestational development and dilatation well beyond the expiration

of full term. A condition of apathy similar to this exists frequently in the involuntary bowel-muscles, either primarily from deficient innervation, or secondarily as a consequence of repeated careless suppression of the natural impulse to faecal evacuation or as a result of chronic disease of some sort. Such a condition may be corrected, in part, in many cases by the prolonged use of strychnine sulphate in minute doses (grain 1/60) administered internally; or, more promptly, by the daily hypodermic use of eserine hydrochlorate (grain 1/60) at appropriate fixed intervals, or by the daily use, hypodermically, of one-half to one ampule ($\frac{1}{2}$ to 1 c.c.) of pituitrin, morning and afternoon. Of course, it will not be necessary to emphasize that these drugs cannot be used safely in the presence of intestinal obstruction due to carcinomatous disease, or that arising from intestinal paralysis due to sepsis or traumatism, for fear of establishing a condition of reversed peristalsis. In properly selected cases, however, most excellent results may be obtained in many instances.

The Anal or Rectal Reflex.—In the ordinary case of constipation arising from intestinal apathy remarkable results may be speedily obtained, in many instances, by resorting to the artificial stimulation of the normal reflex of the lower bowel. We, as a profession, have been far too lax in such matters, and have not made the practical use that we should have done of these natural reflex stimuli. It is far from my intention to enter deeply into the physiology of the anal reflex at this time. It is necessary, however, that a cursory review of the subject should be made in order that a more thorough comprehension of the value of the reflex from a practical standpoint may be entertained.

The *superficial* body reflexes are those which are elicited from receptive fields on the surface of the body (known as *extero-ceptive fields*); they are normally excited by extraneous stimuli acting on the surface of the body environmental to the affected part or organ. Also, the short spinal reflexes are those in which the muscular response takes place in the same region as the application of the stimulus. The plantar, cremasteric, gluteal, anal, abdominal, epigastric, and interscapular reflexes are examples of superficial body reflexes.

The investigations of Byron Robinson, who may be considered a pioneer in this field of research, are well known, through his diagrams of the abdominal and pelvic brains, to the abdominal surgeon. According to this observer, the pelvic brain practically emits the nerves to the pelvic viscera, but especially gives origin to the sympathetic plexuses of the genital tract, namely, the uterine, vaginal, vesical and rectal plexuses. "The rectal plexus," he states, "is a fine plexiform leash of nerves which passes distalward on the lateral borders of the rectum intimately blending with the tissues of the rectal wall." The rectum, he showed, has not only a rich and complicated nerve supply, but it has a mixed nerve supply. These nerves come from the superior hemorrhoidal plexus, the interiliac plexus (from the abdominal brain), the median hemorrhoidal plexus (which accompanies the median hemorrhoidal artery), the inferior hemorrhoidal plexus (which supplies mixed vasomotor and spinal nerves), the rectal plexus (from the pelvic brain), the sacral spinal plexus (including branches from the second, third, and fourth sacral nerves), and the lateral sacral ganglia.

Since Robinson's studies, physiologists have explored somewhat extensively the pelvic and abdominal nervous system, including the sympathetic ganglia. Especially have the labors of S. W. Ransom, Lehmann, Head, Klee, Langley and Anderson, and Gaskell contributed invaluable to our knowledge of the subject. As a practical result of the work of these men some definite data may be adduced. Thus, we now know that the first ganglion of the pelvic nerve (*nervus erigens*), which lies by the side of the rectum, is especially responsible for the innervation of the rectum and the rectococcygeal muscle. Also, that there are two sets of nerve-fibres supplying the descending colon, rectum, bladder and external generative organs and that the origin of these fibres from the spinal cord and their peripheral course have many points in common. Likewise, Langley and Anderson have shown that the nerve-fibres which belong to the somatic division of the pelvic nerve supply the external sphincter of the anus and the bulbo-cavernosus, ischio-cavernosus, and other muscles of this region, and that these nerve-fibres have no nerve-cells on their course and resemble ordinary motor nerves to skeletal muscles. Head found that the sensory nerve-fibres from the rectum terminate in the second,

third, and fourth segments of the sacral cord. So much, briefly, for the nervous anatomy of the rectum.

When we turn to the recent physiology of the pelvic nerve we find some interesting facts worth noting, primary among which is the observation that stimulation of the sciatic nerve causes contraction of the colon and rectum with relaxation of the internal sphincter of the rectum—a symptom complex known as the *defecation reflex*. The efferent path for this reflex, as Ransom notes, is in the visceral branches of the sacral nerves, and the centre is in the medulla oblongata, as is proved by the fact that section of the spinal cord at any level will obliterate the reflex. This is in line with the finding of Langley and Anderson that if the pelvic nerve is stimulated peripherally to the first ganglion there will follow a strong contraction of the rectococcygeal muscle and of the walls of the rectum; and also with Lehmann's observation that central stimulation of the vagus and somatic sensory nerves produces the movements of defecation, while central stimulation of the splanchnic, hypogastric and sacral visceral nerves exerts predominately an inhibitory influence upon defecation. Lehmann, moreover, found that strong stimulation of the abdominal splanchnic nerves occasionally called forth the defecation reflex. Ransom, commenting upon this observation of Lehmann, remarks that "it is surprising that it is not easier to obtain this response from the nerves to the large intestine, since, according to Cannon and Müller, the reflex is normally excited by the entrance of the *fæces* into the rectum."

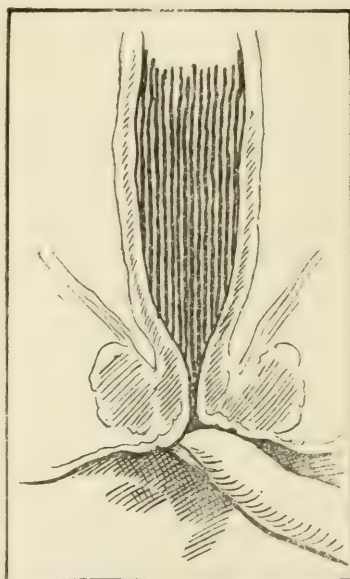
We must, therefore, from the foregoing cursory review of the subject, conclude that defecation usually involves a reflex through the spinal cord, and that under normal conditions a voluntary factor—contraction of the abdominal muscles—enters into the process of defecation. Bearing these conclusions in mind, we may now turn to the practical application of the defecation reflex to the relief of constipation.

Excitation of the Rectal Reflex.—In most of the average cases of constipation it is not necessary for the patient to sit upon the commode for ten or fifteen minutes waiting for the spontaneous appearance of the defecation reflex, aided, as is usual, by violent

efforts at straining. The reflex can be artificially excited in a very large percentage of the cases within fifteen or twenty seconds by resorting to the process which I am about to describe, and which the artist has well depicted in the accompanying illustration (Fig. 1). A folded sheet of toilet-paper is laid over the anus; the patient relaxes the sphincters completely and bears down, while with the index finger of the right hand she gently makes a series of rapidly broken compressions, about ten or twelve or less, directly over the anus. On ceasing this motion there will immediately follow a desire to defecate, which should be aided by a gentle bearing down. It has been estimated that the period of time elapsing between the anal stimulus and the initial reflex response is about 0.02 second.

In but very few instances has this simple method failed in securing the desired result when tried by my patients, and then only, I believe, because of an imperfect performance of the manœuvre. It must be borne in mind that holding taut the rectal sphincters will completely abolish the defecation reflex, since this involves a strong contraction of all the muscles of the pelvic floor, which action results in immediate inhibition of the defecation reflex. I believe that if this simple procedure is carefully carried out at a regular daily hour, preferably in the early morning, the average case of constipation will be relieved and a regularity of body-habit established that will work wonderfully for the physical benefit of the patient.

FIG. 1.



Schematic representation, showing extent of area of contraction, after exciting the rectal reflex.

THE REGULATION OF CONCEPTION

Hardly a day passes in which the gynæcologist in active practice is not approached by one or more women with the urgent request for instruction how best to prevent a further increase in family. This has become a source of annoyance to many doctors whose con-

sciences will not permit them to traffic in information of this nature. Moreover, recently the subject has largely found its way into the discussions of scientific bodies, where frequently the statement is seriously made that if the medical profession does not take up the matter it will fall into the hands of various agitators and lay women who will exploit the question from the commercial point of view under the pretense of dealing with a grave economic question.

The subject is obviously one which each practitioner must settle for himself. There are, however, a few general observations which should be noted that may aid him in arriving at a satisfactory disposal of the matter.

In the first place, admitting that the question involves a serious economic problem in that it is generally the poorer members of a community which have the largest families, thereby entailing upon the state the support of these incapable and often defective elements of the population, the question may at once be raised, Why should the solution of this problem be laid entirely upon the shoulders of the medical profession? Does it not also concern just as seriously other educational professions of the country? Is it not as much their peculiar duty to elevate the mental and moral standards of the people at large, thereby generating a state of mental and moral development conducive to productiveness other than mere sexual, and by which less time and opportunity will be afforded the masses for the baser side of life? Then, again, is it proper to forget the self-evident fact that the obvious duty of the medical profession, in accordance with its obligations to the Hippocratic oath, is to conserve life, not to take it nor prevent it?

The argument already mentioned—that if the profession does not assume control of the matter it will fall into the hands of thoughtless enthusiasts and unscrupulous agitators who will exploit it unethically and unmorally—is as fallacious as that if medical men do not establish rules for the termination of undesirable pregnancies such work will fall into the hands of professional abortionists who will conduct the business detrimentally to the welfare of the race. This is not *reductio ad absurdum*, but a just parallel between two equally pernicious propositions. The whole problem, however it is looked at, is destructive, not constructive; but so ingeniously has it been evolved

and presented that even the very elect of the medical profession may be deceived and, temporarily at least, led astray.

To-day all over the so-called civilized world, community centres are being asked to establish chairs and hours of instruction for the wives of the poorer elements of society in the matter of the regulation of conception. The very title given the subject by those most active in its propagation—"birth-control"—is a misnomer, and is itself a just criticism upon the thoughtlessness and ruthlessness of its advocates. The question has nothing whatever to do, in the exact sense of the motives of these faddists, with the control of births; it deals only with the very beginning of the procreative faculty of the race, the limitation of the number of conceptions. Therefore, it strikes much more seriously at the general welfare of the race than does the other interpretation dealing with an obviously smaller number of cases in which mature births are concerned.

The problem of the regulation of conception has met with considerable antagonism not only from the conscientious, ethical members of the medical profession, but also from the deeper thinking members of society who are genuinely and constructively interested in human progress, as well as from those who are religiously inclined. And right here it seems to me that there is one aspect of the matter which has either entirely escaped the notice of those who are its sponsors, or which has purposely been covered up and ignored. How is this information which we are asked to impart to the poorer women of society and those most concerned in limiting the size of their families to be controlled and rigidly bound in its spread and ramifications? How will it be possible to prevent such information from gaining access to the young girls of the community who are not married, but in whom the procreative impulses are strongest? Is it possible to believe that those who are instructed in the use of contraceptives will jealously guard the secret and keep it in the channel for which it was primarily intended? The strongest safeguard for the young girl—aside from the moral instinct, which, unfortunately, is not always at its highest level—is the fear of impregnation. Let this fear be removed; let every girl from the age of puberty know, as she will as certainly as she lives, just how to prevent conception, and what limitation will there be to the active practise of this knowl-

edge and, consequently, to the spread of immorality? Will not illicit intercourse become the rule, instead of the exception, as I believe is the present condition? What guarantee can we have that this will not be the outcome of the whole matter? My personal belief is that not only is the entire subject immoral and unethical but that it is impractical and dangerous to the extreme.

The dreadful destruction of human life which has resulted from the devastation of the World War has made it, in many countries, a very urgent matter to raise the birth-rate, not to still further voluntarily lower it. Moreover, those who have looked seriously into the remote results that have followed the methods of artificially preventing conception are earnestly opposed to the practice. I can do no better in closing this statement of my views than to quote the words of a careful student of economics in this country:

“ You have only to visit the insane asylums to see the appalling ruin to both mind and body brought on by this heinous practice of birth-control. Eighty-five per cent. of the women in Chicago hospitals are ill as a direct result of the practice. The women inmates of our penitentiaries are advocates of birth-control. Can you picture a mother of eight or ten behind prison bars? She would not have the time nor inclination to commit crime. How dare the society woman, idly couched in her luxurious apartment, advocate such a nefarious practice to the good, honest women in our factories and streets? How dare she implant these lessons of indecency and crime into minds pure and untainted? ”

This is the spirited protest of a well-known student of economics who knows that of which she is speaking. And there are other evils springing from the pernicious doctrine. There can be no doubt that it is often the beginning of the end of marital happiness; that it frequently drives husbands to other women; that it fosters illegitimacy, immorality and lewdness; that it is a prolific source of physical and mental disease; that in it venereal diseases find their best benefactor; and that it is the basis of vices of gravest import. Therefore, personally, I wish at this time to enter my word of protest against the whole matter, and my earnest wish that the profession will stand true to its high standards.

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DYSTOCIA FROM OCCIPUT POSTERIOR POSITIONS

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Two erroneous impressions are commonly accepted concerning occiput posterior positions: (1) That the condition is rare, and (2) that it necessarily presents a serious complication of labor. A survey of the text-books and recent literature demonstrates that this position may be found in from 10 to 35 per cent. of all vertex presentations. Williams¹ gives 11 per cent. of 5488 cases, Plass² about the same, and Adair³ quotes a ratio of 30 to 35 per cent. Exact figures vary, depending upon the stage of labor at which one makes his observations, since many of those presenting early in posterior positions will have rotated to an anterior position at a later stage.

Older authorities give a gloomy prognosis in these cases since it was taught that the occiput uniformly rotated to the hollow of the sacrum. This view is still rather commonly quoted. Early and repeated examinations made during labor prove that the large majority of occiput posterior positions rotate spontaneously to an anterior position. Plass² states that of 635 cases in posterior position 419, or 65 per cent., rotated spontaneously anteriorly and 70, or 11 per cent., rotated posteriorly to the hollow of the sacrum. Of those which rotated to an anterior position 98 per cent. were delivered spontaneously as were also 86 per cent. of those which rotated to the hollow of the sacrum. According to Plass, the occiput posterior position causes but little more delay or complications than may be expected in the anterior position. Williams¹ in a recent edition, however, states that labor is slower and that forceps are required more frequently, 10 per cent. as compared with a general average of 3.6 per cent. Adair³ quotes figures indicating that forceps are required ten times as often as in the anterior varieties. One writer,

¹ "Text-book of Obstetrics."

² *Johns Hopkins Hosp. Bull.*, June, 1916.

³ *Amer. Jour. Obstet.*, vol. 71, p. 616.

quoted, reports 38 cases with six foetal deaths. Bill⁴ states that persistent cases cause delay of both first and second stages of labor, and furnish a large percentage of the difficulties and obstacles. The obvious attitude is to concern ourselves seriously only with the relatively infrequent, persistent cases which fail to rotate spontaneously. We must fully realize, however, that these relatively rare cases can and do cause serious dystocia. If the condition pass unrecognized, attempts to deliver in the usual manner by forceps often result in serious injury to the mother and a high foetal mortality.

This paper is limited to a consideration of the persistent cases causing dystocia, and will be discussed under several headings: (a) Why do certain ones persist? (b) Why do these persistent cases cause dystocia? (c) Causes of delay and nature of complications. (d) Diagnosis. (e) Personal experience. (f) Indications for and methods of treatment.

WHY CERTAIN CASES OF POSTERIOR OCCIPUT POSITIONS PERSIST

It is commonly taught that practically all vertex presentations engage one of the oblique diameters of the pelvis. The position of the rectum in the left posterior portion of the pelvis shortens the left oblique diameter so that from 70 to 80 per cent. of all vertex presentations engage in the right diameter, *i.e.*, either R.O.P. or L.O.A. (Adair). Many factors have been suggested to explain the relative frequency of anterior and posterior positions of the occiput, but there is nothing definite which can be generally accepted in otherwise normal cases. As has been stated, the vast majority of the posterior positions under favorable conditions rotate anteriorly. But in so doing the head has to make an arc of a circle equivalent to 135 degrees instead of 45 degrees, which is the case with the obliquely anterior positions. Even in these favorable instances some delay is to be expected. The necessary factors to insure this rotation are good flexion of the head and normal syncliticism. In other words, extension of the head, or presentation of one parietal bone, impedes rotation of the head and also advance of the presenting part, since relatively long diameters of the foetal head have to pass through the pelvis. The head presenting in a posterior position probably has

⁴ *Amer. Jour. Obstet.*, vol. 71, p. 486.

a tendency to become relatively extended, or to atypical syncliticism. Moderate contraction of the inlet of the pelvis is said not to have an unfavorable influence on rotation, provided the head becomes engaged. However, contraction of the outlet or "Funnel pelves," especially undue prominence of the ischial spines, does favor posterior rotation of the head to the hollow of the sacrum.

THE CAUSE OF DYSTOCIA IN PERSISTENT CASES

In the persistent cases, dystocia is due to the fact that flexion of the head is less complete. As a result, the occipito-frontal diameter, which is longer than the sub-occipital-bregmatic, must pass through the pelvis. Further extension of the head would result in a brow or face presentation. In favorable cases normal flexion will occur spontaneously as the head descends or will be obtained by manipulation. Following this, descent and anterior rotation will take place, but with more or less delay. In less favorable instances extension may be increased, and descent further impeded. Asyncliticism is more likely to occur in occipito-posterior positions and may result in relative dystocia.

CAUSE OF DELAY AND COMPLICATIONS IN DYSTOCIA

Delay is caused by the added time necessary for anterior rotation in the more favorable cases. This will be mostly in the first stage of labor and, in the absence of repeated examination, the cause for such delay will be overlooked. In less fortunate cases, the longer diameter of the head will require more moulding and longer time in order to pass through the pelvis. In case of pelvic contraction, with marked extension of the head, the obstruction may become absolute. Another cause for delay is premature rupture of the membranes, before dilatation of the cervix is complete. This occurrence is commonly believed to be more frequent in cases of occiput posterior, though on this point there is some difference of opinion. In the series herewith reported the membranes ruptured from two to forty-eight hours before dilatation of the cervix was complete, in 23 of 41 cases. This is greater than the usual average and had an unfavorable effect upon the course of labor. Delay in the first stage and slow dilatation of the cervix is common. The foetal head is not a

good dilator, and may be fixed in the pelvis in such a manner as to cause little or no pressure on the cervix. This latter fact may of itself predispose to the premature rupture of the membranes. Delay in the second stage is due to the impeded descent of the presenting part, slow rotation, or incomplete flexion of the head. Maternal exhaustion or fœtal distress will be more frequent than usual and present indications for interference.

During the period of expectant treatment, one may be satisfied with the indefinite diagnosis of vertex presentation and assume normal conditions to exist. But when operative intervention is undertaken, accurate diagnosis of the position of the head is essential. Failure to determine the exact relation of the head spells *grief* in large letters. Forceps applied and used as for anterior positions will further extend the head and increase the obstruction. Active delivery of the extended head in the posterior position will result in extensive perineal laceration. Unless the position is recognized and forceps properly applied there is grave danger of serious injury to the fœtal head or maternal soft parts.

DIAGNOSIS OF DYSTOCIA

In consideration of diagnosis a few of the more suggestive points will be discussed. Given a vertex presentation, with good active contractions, failure of the head to engage or advance should suggest the possibility of undue extension or posterior position of the occiput. In examining the abdomen one notes that the back lies well to one side and that the small parts are unduly prominent. One shoulder is often felt above the symphysis. The fœtal heart is best heard in the flank. The abdominal examination is frequently of more value than the vaginal, unless the latter be made with full relaxation under anæsthesia. Recognition of the fontanelles and sutures may be difficult in case of marked moulding or caput succedaneum. The junction of the three sutures at the posterior, or of four sutures at the anterior fontanelle, and the relation of these to each other, and to the pelvis will be of assistance. In order to be sure one should locate the posterior ear and determine its exact relation to the skull and to the pelvis. In my experience this can only be done under full anæsthesia.

PERSONAL EXPERIENCE IN TREATING CASES OF DYSTOCIA

The experience upon which this paper is based includes 41 cases of posterior position of the occiput which persisted to a point where operative assistance was necessary. No attempt is made to calculate percentages. There were several cases in which spontaneous rotation was observed and which subsequently were delivered without assistance. No doubt others were overlooked. Two were known to have undergone rotation and were delivered in the anterior position with forceps. These are included in this series, but one may be sure that others were missed in the absence of repeated examination during the first stage of labor. It also is probable that the group in which the head failed to engage should have included several others which were delivered by version or abdominal section but with no specific diagnosis of the position. The series includes 27 primiparæ and 14 multiparæ, all at full term.

Of the primiparæ: Five were under 20, fifteen from 20 to 25, four from 25 to 30, two from 30 to 35, and one was 38 years of age. Two had moderately contracted pelves with a diagonal conjugate of from 11 to 11½ cm. The duration of the first stage of labor was: Less than 10 hours in two, from 10 to 15 hours in ten, 15 to 20 hours in six, 20 to 30 hours in five, and over 30 in one, one not recorded. The second stage lasted more than 1 hour in two, more than 2 hours in twenty-one, more than 3 hours in three, and 4 hours in one. The membranes ruptured more than 24 hours before the onset of labor in four cases, at the onset in one, during the first stage or before the cervix was dilated in eleven, and during the second stage in ten. These figures would indicate that the first stage of labor was definitely prolonged, an average of 18 hours, and that the second stage gave a good test of labor, only two being less than two hours. In this type of case I consider rupture of the membranes before the cervix is softened and practically dilated as being premature, tending to delay the process of labor. This occurred in fully two-thirds of the cases.

Of the multiparæ: Seven were under 25, five from 30 to 40, and two were over 40. Five of these women had had serious difficulty in preceding labors, three had flat pelves in which the head failed to engage after a long first stage, one had had an occiput posterior

in a previous labor, and one had a funnel pelvis. Six were known to have had one or more normal labors. All were at term. The duration of the first stage was less than 10 hours in one, from 10 to 20 hours in nine, and over 20 hours in four. The second stage lasted more than one hour in five, and more than two hours in six. The head failed to engage in three after 16, 20, and 24 hours of active first stage pains. These women were delivered by version. The membranes ruptured prematurely before onset of labor in two, at the onset of labor in one, during the first stage in four, and in the second stage in seven.

The mere existence of an occiput posterior position does not of itself justify any active intervention. Preventive measures or early attempts to correct are of doubtful value. Indications for intervention include: (1) Evidence of foetal distress, (2) maternal exhaustion, and (3) undue delay, *i.e.*, failure to advance the head after a reasonable test of labor. This indication is all more or less relative and the personal attitude of obstetricians will vary. In the face of such an event one has to consider: (1) Unrecognized moderate pelvic contraction in primiparæ or in multiparæ who have had previous difficulty; (2) extension of the head or occiput posterior. Careful examination of the abdomen between pains will usually give sufficient information to make the diagnosis. A routine vaginal examination without anæsthesia is often confusing and indefinite, but, if made after full anæsthesia with the entire hand if necessary, will enable one to determine accurately the position and relations.

TREATMENT OF DYSTOCIA

In considering treatment we have two general groups: (1) The head fails to engage after a reasonably long first stage; (2) after becoming well engaged, further advancement fails to take place. Five cases of this series are to be placed in the first class.

(1) A primipara with premature rupture of the membranes failed to engage the head after a long first stage. She was anæsthetized with the intention of doing podalic version, for foetal distress, but this was unsuccessful on account of a rigid uterus. However, the extension was corrected and the head engaged in a

short time to a degree permitting a Scanzonni manœuvre. This was the only baby lost in the series.

(2) A young primipara had partly engaged the head so that a Scanzonni was undertaken unsuccessfully, and labor was successfully terminated by podalic version in cases 3, 4, 5 multiparæ with histories of previous difficult labors and flat pelves which lead to failure to engage the head after 16, 20, and 24 hours each. In most of the patients seen which have been in labor for several hours, especially if the membranes themselves are intact, the cervix will be found dilated or sufficiently soft to permit safe manual dilatation, and delivery by podalic version. When it becomes necessary to terminate labor before the cervix is dilated or safely dilatable, it may be advisable to use some type of a bag, followed by version in case the head fails to engage and descend. The author has considered podalic version only in those cases where firm engagement of the head failed to occur after a good test of labor. Attempts to deliver by high forceps on a floating head or one which is not firmly engaged are unwise and likely to result in disaster for the baby and severe injury to the mother.

In the second group with good engagement of the head before dystocia was evident, may be placed 36 cases of the series. Of these two primiparæ were able to rotate the head to an anterior position and were delivered by means of forceps in that position. It is likely that other such cases occurred but were overlooked. In eight primiparæ and three multiparæ the occiput rotated to the hollow of the sacrum or this was accomplished by forceps, and delivery made in the occiput posterior position. In this group there were two third-degree lacerations of the perineum, the only ones observed in the author's practice. The Scanzonni manœuvre with double application of forceps was done in fifteen primiparæ and eight multiparæ. Of the entire series of 41 cases, 40 babies were discharged living and well, and one was lost. There were two, third-degree lacerations of the perineum in primiparæ. The remaining primiparæ all received some degree of laceration which was successfully repaired with two or three sutures.

With the head engaged in the pelvis, labor should be allowed to progress till there is definite indication for interference, namely,

fœtal distress, maternal exhaustion, or failure to advance, with adequate test in the second stage. Proper analgesia should be used to maintain strength and secure full benefit of second-stage pains. At this point the cervix is usually dilated or safely dilatable. In case it is still rigid, a bag may have to be used, though this procedure was not necessary in this series and should rarely be required.

Three methods of delivery are available. (1) Manual rotating under anæsthesia. Plass and Williams are enthusiastic concerning this procedure and state that it can be accomplished in the majority of cases, seventy-seven of eighty-seven in their series. Where manipulation was required: In their experience this has practically replaced rotation by forceps as in the Scanzonni procedure. I have not given the method a fair trial but propose to do so in the future. (2) Scanzonni's manœuvre, which consists of two steps: (a) Careful application of forceps to the fœtal head, the posterior blade being placed and held over the posterior ear. The other blade is gently manipulated into place and the blades locked. The forceps is then carefully rotated, simply following the natural process in such a manner that the pelvic curve of the instrument is finally reversed. (b) Gentle traction is then made to fix the head in the corrected position and the forceps removed. In some cases delivery could be completed by nature, but as a rule the forceps is re-applied to the R.O.A. or L.O.A. and delivery easily completed. Some authors object to the procedure on grounds of danger of injury to the fœtal skull or maternal soft parts. The operation is not an easy one, but when carefully carried out gives most satisfactory results. In case anterior rotation is not easily accomplished, the occiput may be brought to the hollow of the sacrum and delivered as such without re-application of forceps.

(3) Delivery in the occiput posterior position may be done in unrecognized cases, in those where anterior rotation is not possible, or by election. Plass reports that of 72 cases with posterior rotation 62, or 86 per cent., were delivered spontaneously. Delivery with forceps in the posterior position presents certain objections and difficulties. Ordinary traction increases extension of the head and may result in failure or disaster. Consultants state that most of the instances of failure with forceps are unrecognized occiput posteriors.

Delivery through the vaginal canal brings the long occipito-frontal diameter through the perineum and results in most extensive lacerations. The only third-degree tears I have seen occurred in this position.

CONCLUSIONS

(1) Occiput posterior position is common. (2) Only persistent cases with extension of the head cause dystocia. (3) Labor is prolonged, premature rupture of the membrane is more frequent than normal. (4) Intervention is justifiable only upon definite indications: Fœtal distress, maternal exhaustion, or undue delay or failure to advance. (5) Treatment: Podalic version for persistent cases with the head floating or not firmly engaged. Manual or instrumental rotation of the occiput and delivery in the anterior position when possible. In other cases delivery in the posterior position, taking pains to maintain flexion of the head.

Borderland Topics

THE MEDICAL MAN IN POLITICS

By U. S. SENATOR-ELECT R. S. COPELAND, M.D.

of the State of New York

From time to time it is well to recall that the word "politic" was derived from Greek and Latin sources, which gave it an honorable and distinguished significance. For a long time what was "politic" was synonymous with "political," and the two words were used interchangeably. Anything that was politic or political, as Edmund Burke, for example, employed these words, was defined as a wise, prudent and well-advised measure adapted to promote the public welfare. The word "politic" as I employ it has just this and no other significance. There can be no finer manifestation of ethical feeling and good citizenship than to be concerned with what is politic or wise and well-adapted to promote the common welfare.

A time there was when the priest who was the guide and leader in matters ethical, moral and religious, was physician as well. By slow degrees, as church control disappeared and as medical science superseded the magic and empiricism of our earlier civilization, the priestly and medical function came to be separated. We find, however, that in the enactment of laws, the moral and the health aspects of legislative measures are inseparably united.

To give concrete illustration to this abstract statement, one need go no further back than 1917, when a vital issue presented itself in a law passed by the State of Oregon limiting the hours of labor. When the State attempted to enforce this law, the question of its constitutionality arose and was carried to the United States Supreme Court. It is of the utmost significance to note that in declaring the Oregon law to be constitutional, the United States Supreme Court rested the justice of its decision upon the right of a State to exercise its police power in a matter affecting health—and morals, incidentally.

Our economists and lawyers, who are expert in interpreting legal phraseology and in delving into codes of law, have failed apparently to grasp the enormous significance of this decision, by virtue of which the safeguarding of the health and of the morals of the community is paramount, taking precedence over property rights and other economic and legal considerations. It is of particular significance that the brief which was prepared in defence of the shorter workday devotes hundreds of pages to the citation, not of legal precedents, but to the most detailed medical evidence obtained from the physiological laboratory and from hospital study. The validity of this law was contended for on higher grounds than mere adherence to old formulæ.

Many other examples might be cited to indicate that it is "politic" for our State and National legislators to give utmost attention to considerations of health. A physician, therefore, if he rises to his opportunity, has a most important contribution to make in the legislative work of the Nation.

When Louis Pasteur was made a member of the French Academy, he delivered an address which was notable for its humanity and wisdom. In this address he called attention most strikingly to the contrast between the constructive, conserving and humane endeavors of medical science and the wanton destruction of life and the sinister influences of war which have hampered human development, and which, too often, have been the product of old-fashioned diplomacy, of narrow legislation, greed, and inhumane laws.

The true physician, however much he may be absorbed in attempting to wrest from Nature further revelations as to her mysterious processes, and however great his efforts to solve the problems of health and disease, is at all times concerned in everything affecting the well-being of the community. Social, moral, economic and legal issues concern him because they involve considerations of health, and, in this realm, like the priest of old, he has a message to offer and a rôle to play. The true physician is not only the moral and spiritual guide of the patients who place their mental and physical welfare in his hands, but in similar things he should be the guide of the community or Nation as a whole.

The doctor who confines his labors and achievements to what concerns his individual patients is working in a restricted field. He accomplishes much of value to his fellowman, but of course the effects of his efforts are limited to the individuals or to the families under his direct care. The same degree of energy and intelligence applied on a larger and vaster scale may reach the great mass of persons in the community and the whole State may benefit through his humane and constructive labors.

In the process of making laws, physicians have rarely been consulted or given a proper opportunity for service. It is a pity they cannot apply their training, their experience and their knowledge of human life to the advantage of society. Consider how long a time has elapsed since Sir Robert Peel made his attempts to reform British laws with reference to the protection of children in industry, and how slow has been achievement in such endeavors in affecting legislation in various countries. It should require little argument to persuade any intelligent person that the physician cannot limit himself to a mere attempt to patch up individual injuries to the child, the mother or the male adult. So far as these are the direct or remote results of inadequate or defective laws, he has a social duty to do, and he has a function to perform in determining what is "politic."

If one will study legislation as it may effect the cost of living, or as it relates to the facility with which people may obtain those things essential to decency, comfort, health and life, it will become apparent that many forms of legislation which at first blush seem utterly without any relation to the health of the community, derive a special significance because of their ultimate influence upon health. This is a thing which is often utterly overlooked.

For example, tariff legislation and other laws which affect the cost of living have the most vital influence upon public health. Many studies have indicated that as the cost of living increases, those who are already ill find it increasingly difficult or impossible to secure not only adequate treatment, but also the necessities of life upon which prompt recovery and unhampered convalescence depend in many instances. Among other things I have studied the relation of the cost of living to a small fraction of our population, namely, the million and a half sufferers from pulmonary tuberculosis. I

am satisfied that just as soon as the cost of living rises, these sufferers, and their families as well, are deprived of milk and eggs, of butter and other indispensable foods which are absolutely needed in their fight against "The Captain of the Men of Death." As a result, the national health suffers.

Further, tariff laws that affect the cost of building materials, inevitably prevent the development of proper housing facilities, and as a logical result we find the health conditions in the country at large adversely affected by unavoidable crowding, by the inability of persons to avoid close contact with those who have disease, by the lack of adequate ventilation, and other consequences of poor housing, which break down resistance and predispose to disease.

Whether the laws relate to the prohibition of liquor or to questions that seem to have a strictly economic aspect, they react eventually upon the health conditions of the country. Surely in matters so vital to national and individual welfare and happiness, as well as to the prevention of dependency and delinquency, the voice of the physician is needed in the councils of the Nation. He should be there to exercise the influence of his special knowledge upon legislation. He should warn and counsel his colleagues in the legislative chambers of the Nation against the sins of omission and commission which may be of vital importance in their ultimate effect upon National welfare, especially so far as health is concerned.

It is "politic" for the Nation that the physician should be connected intimately with the law-making branch of our Government, for the purposes of protecting children in industry, to secure the introduction of health regulations and agencies to prevent the decimation of our infant population, to see that child-birth is made safer and that it be not allowed to claim the great host of victims it annually takes. We need the doctor in politics to protect women in industry, and men as well; to formulate policies for safeguarding our country from the visitation of epidemics originating in foreign countries; to guard the food supply and to keep it pure.

These are but a few of the many functions which the physician may exercise in the matter of health protection. This is something of what he may contribute by reason of his special and expert train-

ing and his special knowledge obtained through contact with the ills which our defective or inadequate laws help bring about.

Let it not be forgotten, moreover, that physicians, as men of culture and of practical training, and as good citizens who are alert and interested in matters of civic import, are quite as capable of participating in the deliberations of the legislative branches of our Government as are men in other vocations. These considerations make it "politic" for the medical men of this country to see to it that those in their profession who have given special study to the affairs of the Government, who have had administrative experience, and who are especially versed in the relation of health to the various economic and social conditions of community life, should not withdraw themselves from participation in the conduct of our Government, but should give the benefit of their special gifts and experience to the service of the Nation. As doctors, we need to take part in the political life of the Nation. We have something of value to contribute, and we dare not therefore shirk our obligation to render service to the Nation as a whole, so that the good we attempt to do to individuals may be magnified and multiplied.

THE ETHICS OF PHARMACY

By CHARLES H. LaWALL, Ph.M., Sc.D.

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THE year 1922 was marked by a wave of great interest in the subject of ethical rules and procedures. The May, 1922, issue of the *Annals of the American Academy of Political and Social Science* devoted over two hundred pages to a consideration of this topic. In this volume are discussed such general phases as the "Significance of the Professional Ideal," and the "Interrelation of the Professions," and then there are taken up in detail the ethical codes and rules governing the following callings: Law, medicine, dentistry, pharmacy, nursing, engineering, architecture, teaching, library work, the ministry, journalism, accounting, and general business.

The consensus of opinion seems to be that detailed codes are preferable to those couched in general terms. The matter of detail can be overdone, however. A code of ethics is an evidence of group consciousness and if it leads to group "smugness" or group aggrandizement it defeats its own object. The unethical and the illegal are not necessarily the same. Altruism is the dominant note in the most respected and successful codes. Some sort of responsibility has been acknowledged and set forth in definite terms by many groups of workers in ages past.

In an ideal state of civilization, where all individuals are intelligent, conscientious and careful of the rights of others, no rules for guidance will be needed. The oldest code of ethics, intended for mankind in general and not for a restricted group, is the Ten Commandments. The most concise code in existence is the Christian Golden Rule.

The oldest professional codes are associated with the practice of medicine and are embodied in the Hippocratic Oath, the Code of Hammurabi and the Prayer of Maimonides.

Inasmuch as pharmacy was an integral part of the practice of medicine in many countries, including our own, until less than a hundred years ago, the same individual being responsible for both

the preparation and the administration of the prescribed remedy, pharmacists may claim the high-minded idealism of these codes as part of their professional inheritance.

When a line of demarcation occurred between the two callings of medicine and pharmacy, the establishment of codes to govern the members of the pharmaceutical guilds became necessary, and a few of these have come down to us from some of the writings of the earlier times.

A prominent English apothecary of the sixteenth century, Bulleyn by name and a cousin of the ill-fated Anne Bulleyn, formulated the following rules, which are interesting as casting some illumination upon the practice of medicine of the day as well as the practice of pharmacy:

“The apothecary must first serve God; foresee the end, be cleanly and pity the poor. His place of dwelling and shop must be cleanly to please the senses withall. His garden must be at hand with plenty of herbs, seeds and roots. He must read Dioscorides. He must have his mortars, stills, pots, filters, glasses and boxes clean and sweet. He must have two places in his shop, one most clean for physick and the base place for chirurgic stuff. He is neither to increase nor diminish the physician’s prescription. He is neither to buy nor sell rotten drugs. He must be able to open well a vein, for to help pleurisy. He is to meddle only in his own vocation, and to remember that his office is only to be the physician’s cook.”

The earliest formal and comprehensive code of ethics of which we have any record in the English-speaking countries is one adopted by the Philadelphia College of Pharmacy in 1848, twenty-seven years after its founding.

This code, which requires about a thousand words for its expression, exemplifies the highest ideals of pharmaceutical service and is noticeable for its broad spirit of humanitarianism. It covers such details as fee splitting, responsibility for secret medicines, fair prices for proper service, proper method of correcting prescription errors, responsibility for quality of medicines, the proper control of the dispensing of narcotic drugs and the education of apprentices.

The code of the Philadelphia College of Pharmacy was followed a few years later, in 1852, by a somewhat similar code adopted by

the American Pharmaceutical Association. Soon after this period the state pharmaceutical associations began to formulate and adopt rules which, differing in detail, held true in the main to the high principles established in the earlier codes.

Changes in practice necessitate changes in guidance and inasmuch as other professions had seen fit to amend their codes and bring them up to date, the American Pharmaceutical Association placed itself on record at its annual meeting in 1922 by the adoption of a more modern code which is the latest expression of the aims and ideals of pharmaceutical practice and which is as follows:

CODE OF ETHICS OF THE AMERICAN PHARMACEUTICAL ASSOCIATION ¹

CHAPTER I

The Duties of the Pharmacist in Connection with His Services to the Public

Pharmacy has for its primary object the service which it can render to the public in safeguarding the handling, sale, compounding and dispensing of medicinal substances.

The practice of pharmacy demands knowledge, skill and integrity on the part of those engaged in it. Pharmacists are required to pass certain educational tests in order to qualify under the laws of our states. The states thus restrict the practice of pharmacy to those persons who by reason of special training and qualifications are able to qualify under regulatory requirements and grant to them privileges necessarily denied to others.

In return the states expect the Pharmacist to recognize his responsibility to the community and to fulfil his professional obligations honorably and with due regard for the physical and moral well-being of society.

The Pharmacist should uphold the approved legal standards of the United States Pharmacopœia and the National Formulary for articles which are official in either of these works, and should, as far as possible, encourage the use of these official drugs and preparations and discourage the use of objectionable nostrums.² He should sell and dispense only drugs of the best quality for medicinal use and for filling prescriptions.

He should neither buy, sell nor use substandard drugs for uses which are in any way connected with medicinal purposes.

The Pharmacist should be properly remunerated by the public for his knowledge and skill when used in its behalf in compounding prescriptions, and his fee for such professional work should take into account the time consumed and the great responsibility involved as well as the cost of the ingredients.

The Pharmacist should not sell or dispense powerful drugs and poisons to persons not properly qualified to administer or use them, and should use every

¹ Adopted August 17, 1922.

² An objectionable nostrum is one which does not meet the requirements of the definition of the Commission on Proprietary Medicines of the American Pharmaceutical Association.

proper precaution to safeguard the public from poisons and from all habit-forming medicines.

The Pharmacist, being legally entrusted with the dispensing and sale of narcotic drugs and alcoholic liquors, should merit this responsibility by upholding and conforming to the laws and regulations governing the distribution of these substances.

The Pharmacist should seek to enlist and merit the confidence of his patrons and when this confidence is won it should be jealously guarded and never abused by extortion or misrepresentation or in any other manner.

The Pharmacist should consider the knowledge which he gains of the ailments of his patrons and their confidences regarding these matters, as entrusted to his honor, and he should never divulge such facts unless compelled to do so by law.

The Pharmacist should hold the health and safety of his patrons to be of first consideration; he should make no attempt to prescribe or treat diseases or strive to sell drugs or remedies of any kind simply for the sake of profit.

He should keep his pharmacy clean, neat and sanitary in all its departments and should be well supplied with accurate measuring and weighing devices and other suitable apparatus for the proper performance of his professional duties.

It is considered inimical to public welfare for the Pharmacist to have any clandestine arrangement with any physician in which fees are divided or in which secret prescriptions are concerned.

The Pharmacist should primarily be a good citizen, and should uphold and defend the laws of the state and nation. He should inform himself concerning the laws, particularly those relating to food and drug adulteration and those pertaining to health and sanitation and should always be ready to coöperate with the proper authorities having charge of the enforcement of the laws.

The Pharmacist should be willing to join any constructive effort to promote the public welfare and he should regulate his public and private conduct and deeds so as to entitle him to the respect and confidence of the community in which he practices.

CHAPTER II

The Duties of the Pharmacist in His Relations to the Physician

The Pharmacist even when urgently requested to do so should always refuse to prescribe or attempt diagnoses. He should, under such circumstances, refer applicants for medical aid to a reputable legally qualified physician. In cases of extreme emergency as in accident or sudden illness on the street in which persons are brought to him pending the arrival of a physician such prompt action should be taken to prevent suffering as is indicated by humanitarian impulses and guided by scientific knowledge and common-sense.

The Pharmacist should not, under any circumstances, substitute one article for another, or one make of an article for another in a prescription, without the consent of the physician who wrote it. No change should be made in a physician's prescription except such as is essentially warranted by correct pharmaceutical procedure, nor any that will interfere with the obvious intent of the prescriber, as regards therapeutic action.

He should follow the physician's directions explicitly in the matter of refilling prescriptions, copying the formula upon the label or giving a copy of the prescription to the patient. He should not add any extra directions or caution or poison labels without due regard for the wishes of the prescriber, providing the safety of the patient is not jeopardized.

Whenever there is doubt as to the interpretation of the physician's prescription or directions, he should invariably confer with the physician in order to avoid a possible mistake or an unpleasant situation.

He should never discuss the therapeutic effect of a physician's prescription with a patron nor disclose details of composition which the physician has withheld, suggesting to the patient that such details can be properly discussed with the prescriber only.

Where an obvious error or omission in a prescription is detected by the Pharmacist, he should protect the interests of his patron and also the reputation of the physician by conferring confidentially upon the subject, using the utmost caution and delicacy in handling such an important matter.

CHAPTER III

The Duties of Pharmacists to Each Other and to the Profession at Large

The Pharmacist should strive to perfect and enlarge his professional knowledge. He should contribute his share toward the scientific progress of his profession and encourage and participate in research, investigation and study.

He should associate himself with pharmaceutical organizations whose aims are compatible with this code of ethics and to whose membership he may be eligible. He should contribute his share of time, energy and expense to carry on the work of these organizations and promote their welfare. He should keep himself informed upon professional matters by reading current pharmaceutical and medical literature.

He should perform no act, nor should he be a party to any transaction, which will bring discredit to himself or to his profession or in any way bring criticism upon it, nor should he unwarrantedly criticise a fellow Pharmacist or do anything to diminish the trust reposed in the practitioners of pharmacy.

The Pharmacist should expose any corrupt or dishonest conduct of any member of his profession which comes to his certain knowledge, through those accredited processes provided by the civil laws or the rules and regulations of pharmaceutical organizations, and he should aid in driving the unworthy out of the calling.

He should not accept agencies for objectionable nostrums nor allow his name to be used in connection with advertisements or correspondence for furthering their sale.

He should courteously aid a fellow Pharmacist who may request advice or professional information or who, in an emergency, needs supplies.

He should not aid any person to evade legal requirements regarding character, time or practical experience by carelessly or improperly endorsing or approving statements relating thereto.

He should not imitate the labels of his competitors nor take any other unfair advantage of merited professional or commercial success. When a bottle or package of a medicine is brought to him to be refilled, he should remove all other labels and place his own thereon unless the patron requests otherwise.

He should not fill orders which come to him by mistake, being originally intended for a competitor.

He should deal fairly with manufacturers and wholesale druggists from whom he purchases his supplies; all goods received in error or excess and all undercharges should be as promptly reported as are shortages and overcharges.

He should earnestly strive to follow all proper trade regulations and rules, promptly meet all obligations and closely adhere to all contracts and agreements.

This code follows closely in its general plan of arrangement to the Principles of Medical Ethics adopted by the American Medical Association in 1912.

Medicine and pharmacy are so closely allied in their objects and are so interdependent upon each other's adherence to ethical standards for their success that there is great need for a still closer working union than is afforded by the separate codes as adopted by the leading representative organizations of these respective professions. The next step should be a code of medico-pharmaceutical ethics. Several such codes are already in existence. The earliest of these of which I have found any record is the set of "Rules of the Antwerp Medical and Pharmaceutical Professions" adopted in 1877, which is as follows:

RULES OF THE ANTWERP MEDICAL AND PHARMACEUTICAL PROFESSIONS

(1) Each member of the two branches of the medical corps should abstain from interfering with the prerogatives of the other; the physician should not furnish any medicine to his patients, and the pharmacist should avoid giving medical advice; the pharmacist may, within the limits of the law, furnish medicines which may be asked for, such as a cough mixture, a sedative draught, a purgative, copaiba capsules, etc., without, however, advising that such or another preparation was more suitable.

(2) The physician and pharmacist should conduct themselves toward each other with the sentiments of kindness and confraternity, which unite the members of a family, and should avoid, in the presence of the client, every kind of reflection and unfair remarks; a conciliatory council should be appointed for smoothing such disputes as may arise on the subject of medical practice.

(3) Finally, physicians should, as rarely as possible, prescribe secret remedies and pharmaceutical specialties; on the other hand, pharmacists should abstain from advertising them.

A later and more detailed code of interprofessional ethical rules comes to us from our antipodal brethren in Australasia. The rules formulated are so common-sense that they are well worthy of consideration in this country. The following code was adopted jointly by physicians and pharmacists in Melbourne in 1917:

MEDICOPHARMACEUTIC ETHICS

At a conference held in Melbourne between representatives of the Victoria Branch of the British Medical Association and representatives of the Pharmaceutical Society of Australasia, the Pharmacy Board and Pharmaceutical Defence Ltd., the following rules of practice, among others, were adopted.

(1) *Prescriptions—Doubtful Interpretations.*—In cases where there is some doubt regarding the interpretation of any prescription, it shall be the duty of the pharmacist dispensing the same to communicate with the prescriber if possible. It is preferable that such communication should be in writing. In cases where it is necessary to telephone to the prescriber, care should be taken to see that the conversation is as private as possible.

(2) *Correction by Prescriber.*—The prescriber in such a case will recognize that the pharmacist is simply performing what is an important part of his professional duty, and will at once coöperate with him in the interest of his patient. He will correct or confirm the prescription. If a correction is necessary, he may request the pharmacist to retain the prescription, and will forward to him the corrected one. As far as possible, verbal corrections should be confirmed in writing.

(3) *The Attitude of Prescriber and Dispenser* should be one of mutual respect and coöperation.

(4) *Unusual Characteristics.*—In cases where a prescription contains (a) an incompatibility, (b) an unusually large dose, (c) a dangerous dose, or possess some other characteristic of an unusual nature, the prescriber shall indicate that such peculiarity is intended, and is not inadvertent, by underlining that particular part of the prescription, and initialing the same in the margin.

(5) *Where Prescriber Cannot be Consulted.*—Where a pharmacist is doubtful of the interpretation of a prescription, and it is not possible to consult the prescriber, he shall, after careful consideration, modify the prescription in accordance with what he believes to be the intention of the prescriber. He should, if possible, subsequently communicate with the prescriber by letter, and inform him of what he has done. Care should be taken to see that such discretion, when exercised, does not interfere with the therapeutic value of the medicine.

(6) *Modifications to be Noted.*—Where a pharmacist finds it necessary to modify a prescription, under paragraph 5, he should make a marginal note on the prescription indicating the course he has adopted in dispensing the prescription. The marginal note should be as brief as possible.

(7) *Prescribing by Telephone.*—When prescriptions are dictated by telephone, the following rule should be observed: The prescriber should first write out the prescription, and then read it through the telephone to the dispenser. He should request the dispenser to read to him the prescription as taken down, and should, as soon as possible, forward the original prescription to the pharmacist either by post or by the patient.

(8) *Criticism Deprecated.*—It is undesirable that a prescriber should adversely criticize a pharmacist unless he is guilty of some offense in his calling. The pharmacist on his part should refrain from discussing with the patient the prescriber or the merits of his prescription. Matters relating to professional fees or prices charged for medicines should not be discussed with patients.

(9) *Unsigned Prescriptions*.—When a prescription is received with the “usual signature,” the pharmacist should ascertain from the patient the name of the prescriber, and, if possible, submit the prescription for his signature before dispensing it so as to relieve the prescriber as well as himself from the risk of penalty. The use of a rubber stamp in lieu of the prescriber’s written signature should be avoided.

(10) *Repetition of Prescriptions*.—When it is desired that a prescription should not be repeated, the prescriber should write on the prescription, “Not to be Repeated,” or “To be Repeated Twice Only,” or any specific number of times. In cases where such directions are given, the pharmacist who dispenses the prescription should endorse the prescription as follows: Supplied (here insert date and pharmacist’s signature).

(11) *Spoonfuls—to be Abandoned*.—With the object of securing greater accuracy in dosage, the use of the words “*teaspoon, dessertspoon, and tablespoon*” in the directions on a prescription should be discouraged. Prescribers should write the dosage in drams or ounces, and patients should be advised to measure the doses in a measure-glass.

What is needed in every civilized country is an interprofessional code upon some such lines as the above. A definite movement of this kind would benefit the several professions by stimulating the development of an *entente cordiale* which already exists between thousands of individual members of these two important professions, but which has not yet crystallized into organized action.

Surgery

UNIVERSAL CRANIOTOMY

FROM THE CLINICO-SURGICAL INSTITUTE OF THE FACULTY OF MEDICINE
OF BUENOS AIRES (PROF. ARCE) *

By WILLIAM ZORRAQUIN

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THIS experimental, but practical, form of craniotomy is based on the superposition of four concepts: Clinical, surgical, anatomical and operative.

CLINICAL CONCEPT

Our realization is that of a homogeneous decompression in cranial hypertension such as nature produces in pathological conditions by creating a large artificial fontanelle at the bregma.

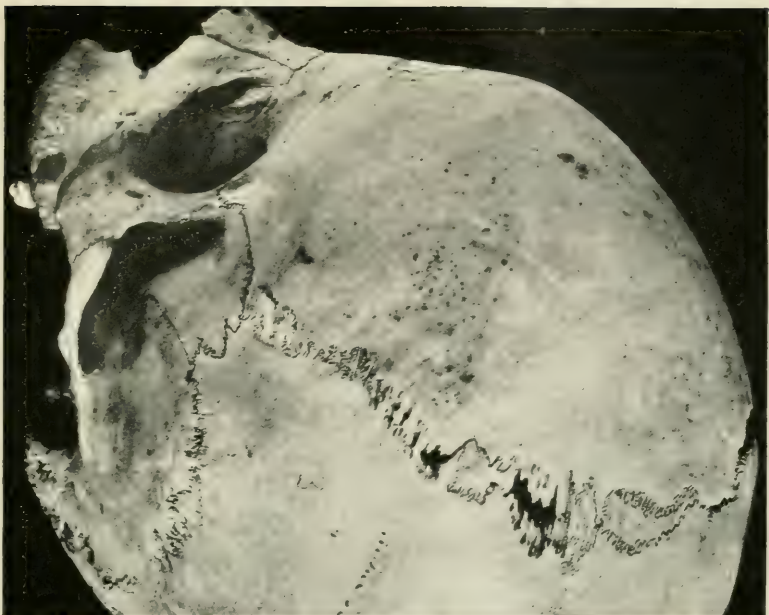
In flattened vaults, to which type the cranium belongs, the point of least resistance to an excentric displacement—not considering the lateral braces or pillars—corresponds to the largest area of development of the vault. Here the excentric pressure is most destructive, and this point corresponds to the bregma. This condition explains:

(1) Why nature in cases of cranial hypertension brings about the dehiscence of the coronary or fronto-parietal suture in preference to the dehiscence of any other suture of the cranium. The specimen shown in Fig. 1, which belongs to the collection in Doctor Llambias' Institute, well illustrates this point.

(2) Why "perforating tumors of the cranium" bring about their pathological fontanelle preferably at this level. Fig. 2 (specimen No. 308 of the Dupuytren Museum) and Fig. 3 (No. 339 of Doctor Llambias' Museum) well show these lesions.

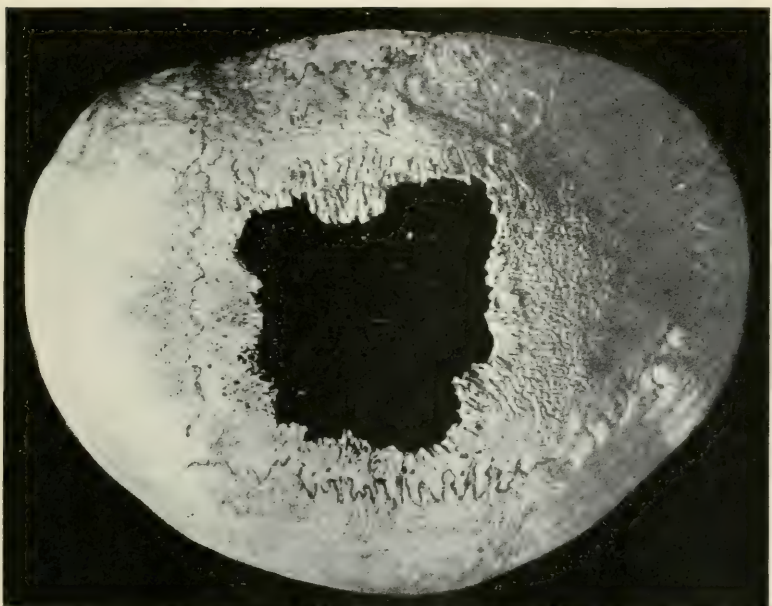
* This article is also published in Spanish and French.

FIG. 1.



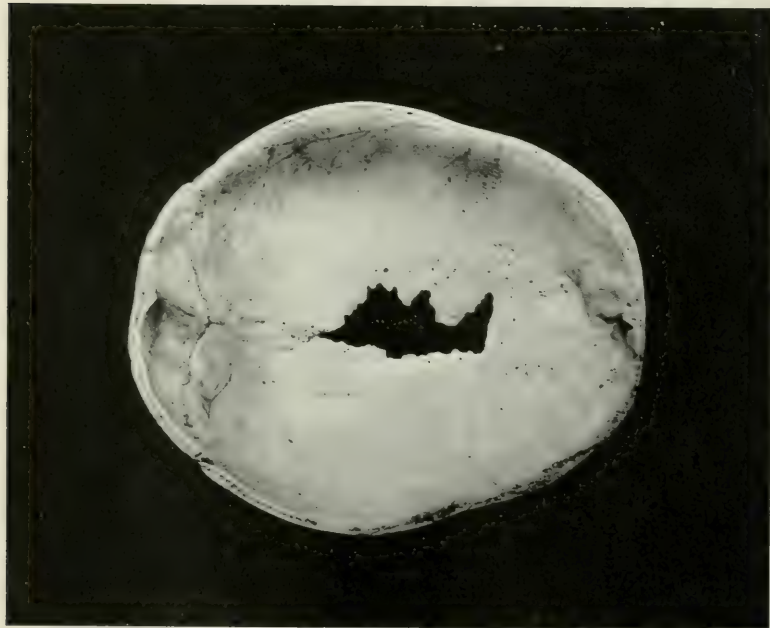
Nature's method of opening up the coronal suture in cranial hypertension.
(Collection of Dr. Lambius.)

FIG. 2.



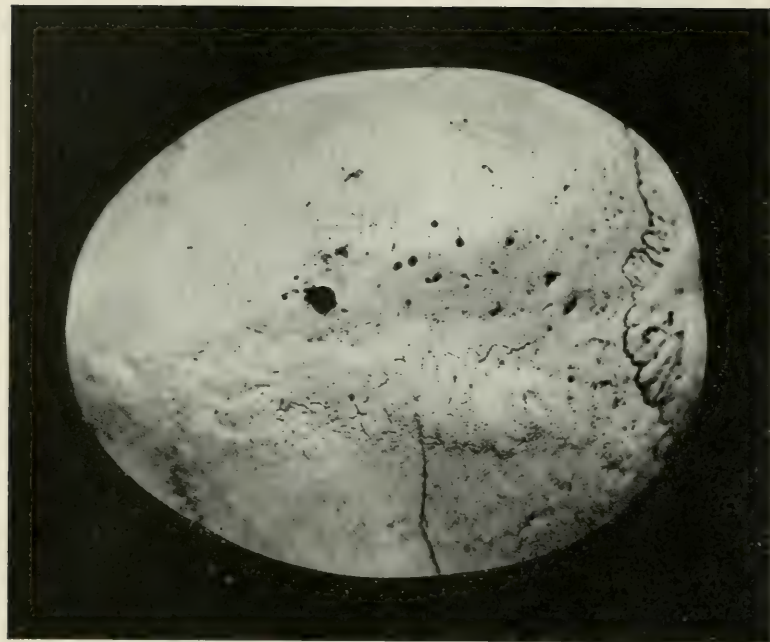
Physio-pathological craniotomy, as seen exteriorly. (Dupuytren Museum,
Specimen No. 308.)

FIG. 3.



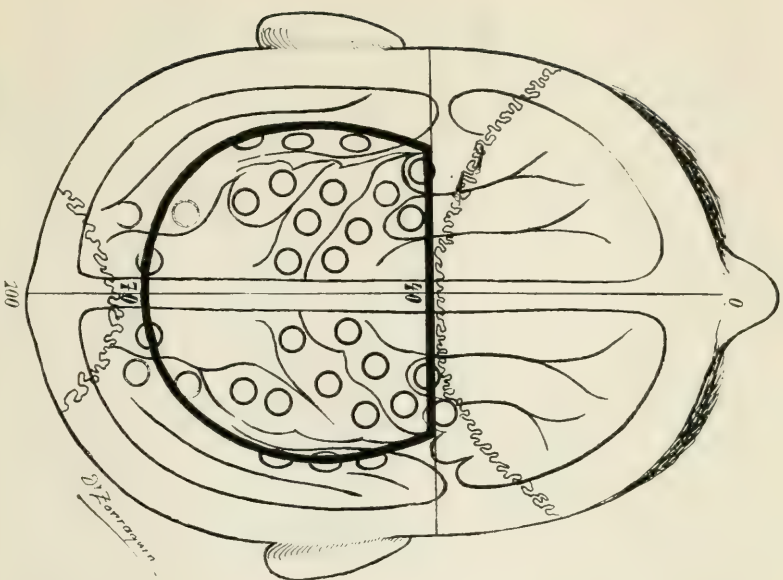
Physio-pathological craniotomy as viewed from inside of skull-cap. (Museum of Dr. Ilambius, Specimen No. 389.)

FIG. 4.



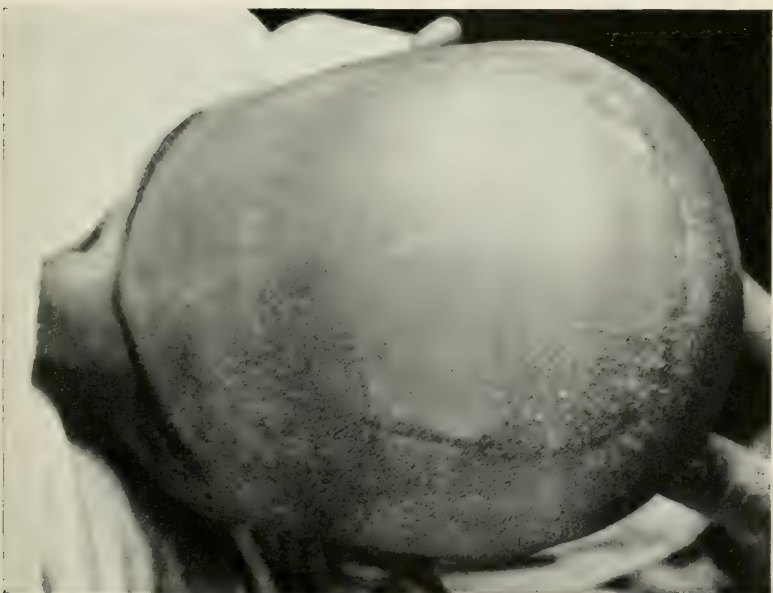
Senile perforation, at a point where the sutures are obliterated.

FIG. 5.



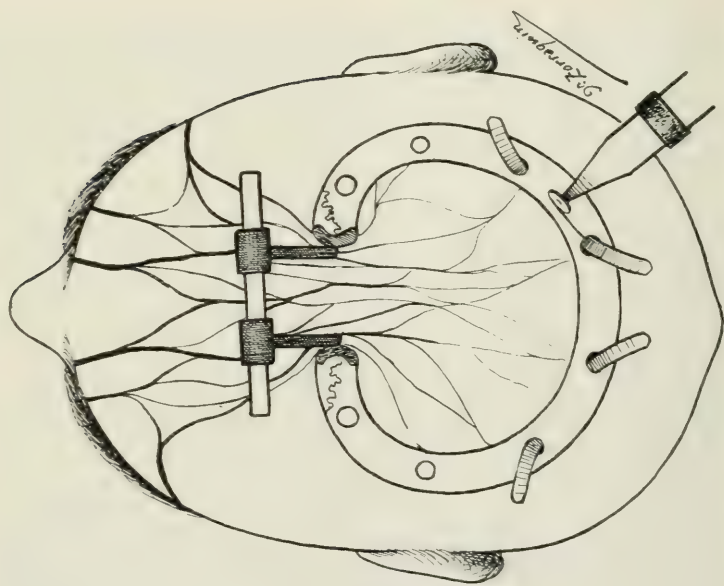
Schematic reproduction of the active zones of the brain on the epicranium. Outline of the detachable zone of Marchant, with outline of operative shell or horse-shoe incision.

FIG. 6.



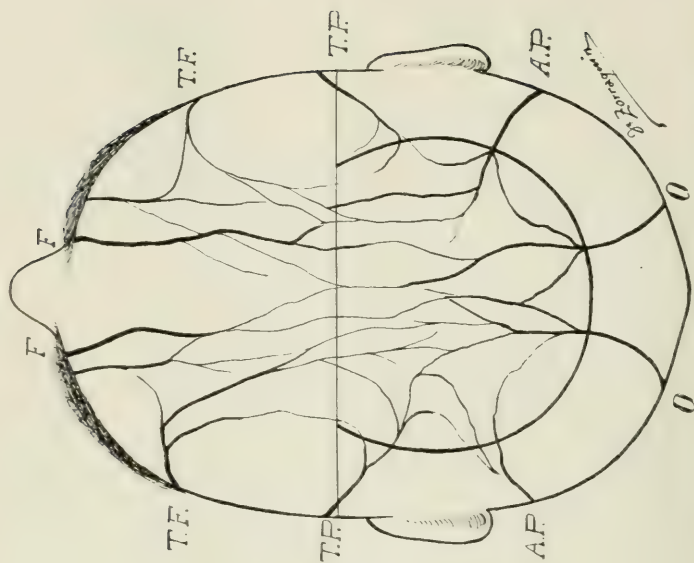
Scar of outline of field of operation on scalp.

FIG. 7.



Schematic representation for performing the operation of universal craniotomy.

FIG. 8.



Schematic projection of the blood-supply on the epicranium.

(3) Why at this level senile perforations of the cranium take place as may be seen in the photograph of the specimen represented by Fig. 4, and why the sutures separate at this point, which are the places of apposition of growth of the bones and of spontaneous dehiscence.

SURGICAL CONCEPT

Our realization is that of a craniotomy which permits the best direct and indirect exploration of the brain, the widest exposure of the dura mater on the active areas of the brain and the best exposure of the detachable area under its surface.

This craniotomy should expose on both hemispheres: The frontal and ascending parietal convolutions, the first temporal convolution, the base of the first occipital convolution and the whole parietal lobe. This area has the form of a shell or of a horseshoe as may be seen in Fig. 5 and by the cicatrice of the patient operated on in Fig. 6.

The external limits of this area are: The anterior limit which forms the straight line of the shell or the open side of the horseshoe, and is marked by the bregma and the coronary suture of the frontoparietal as far as the level of the inferior Rolandic points. Externally this limit is outlined more or less exactly by the pre-auricular area of Kroenlein—also shown in Fig. 5—as far as a point situated 7 or 8 centimetres below the zygoma, or a centimetre in front and in the same horizontal plane as the lower Rolandic points.

The lower limit of this area, which forms the circular margin of its shell or horseshoe shape, is marked by a plane which passes through three points: The two inferior Rolandic points already described, and the third situated three centimetres above the Lambda suture. This latter point may even be put down in the middle of the bregmatic line or a little farther back of the prolongation of the Sylvian fissure on the median line.

Even by modifying the antero-posterior and transverse dimensions of this flap, as nature modifies the relative dimensions of these bones, the described opening easily uncovers the active area of the brain and the detachable area of the dura mater.

ANATOMICAL CONCEPT

The region described above is covered by the lamina of the spheno-parietal vertebra, formed by the parietal bones and of an enormous development in man, and this enormous development of the parietal lamina produces displacements of the soft tissues of its epicranium, such as the great curvature of the temporal artery on the temples and the forehead. It is probable that the situation of the active area of the brain under the parietal lamina is the cause of the great development of the parietal bones and of all modifications of this spheno-parietal vertebra in man.

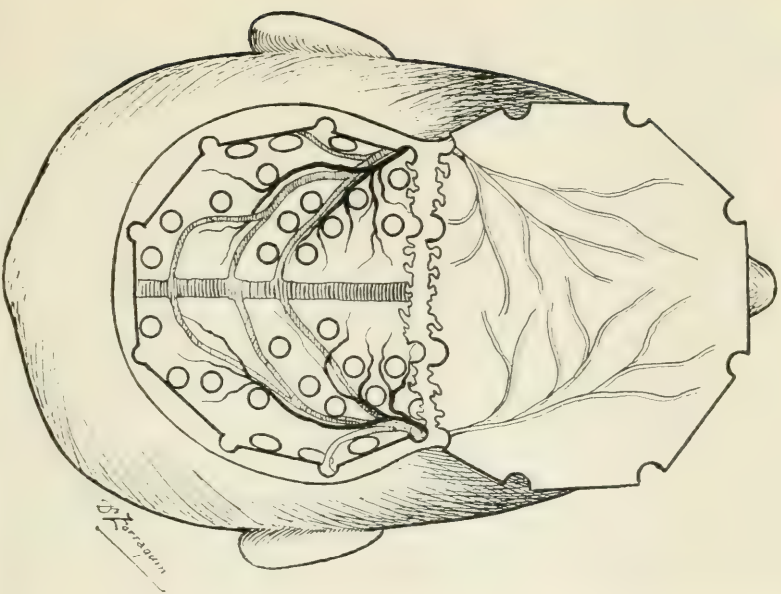
The projection of the active area of the brain on the epicranium (Figs. 8 and 9) shows that the nutrition of this region has an anterior peduncle formed by three pairs of arteries: The frontal and supraorbital arteries, which are derived from the internal carotid through the ophthalmic and temporo-frontal arteries, which come from the external carotid through the superficial temporal artery. These temporo-frontal branches are the most important of this region. They describe successive curves on the temples and forehead before reaching the parietals, being visible in almost their whole course in bald and arteriosclerotic individuals. These latter arteries give the sign of the temporal artery, called the sign of the temporo-frontal, in the clearest manner.

The anterior arterial peduncle formed by these conditions permits us to cut on the area described as a clinical and surgical necessity, a flap whose anterior base follows the coronal or temporo-frontal suture. The vascularization of this flap is practically excessive. This is the reason that it is advisable before the operation to circumscribe the two lines of the future incision with a hemostatic suture of Heidenhain, the margin of the flap as well as the margin of the wound.

OPERATIVE CONCEPT

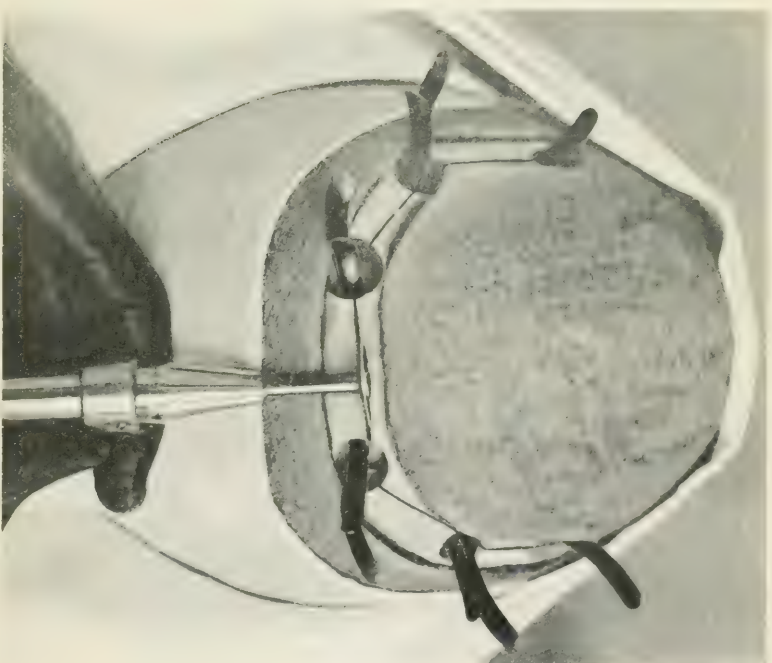
Cutting through the bone of this flap is possible by means of trephinings which permit the insertion of elastic sounds under the bones of the cranium. They are easily detached where it is necessary, from the dura and superior longitudinal venous sinus without tearing nor causing hæmorrhages. (Figs. 10 and 11.)

FIG. 9.



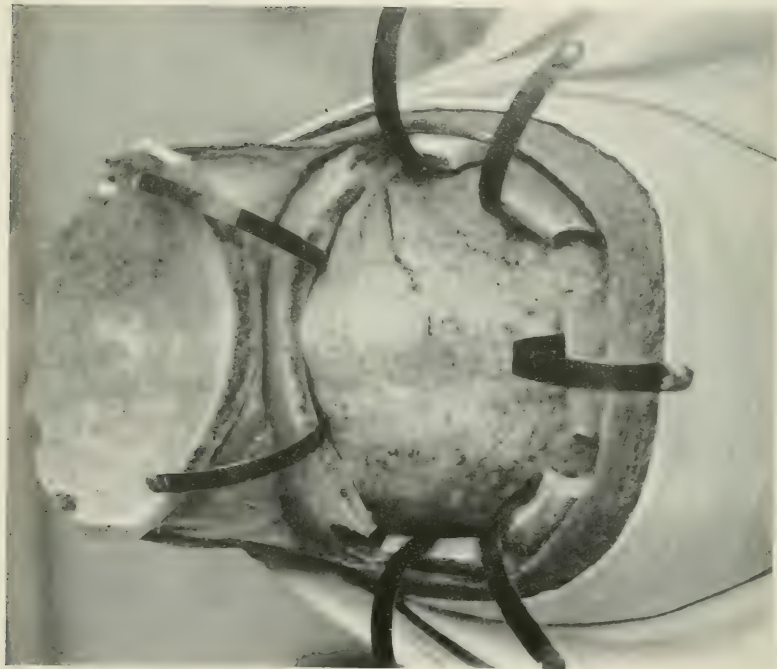
Showing the position of the superior longitudinal sinus and its branches as well as those of the middle meningeal artery.

FIG. 10.



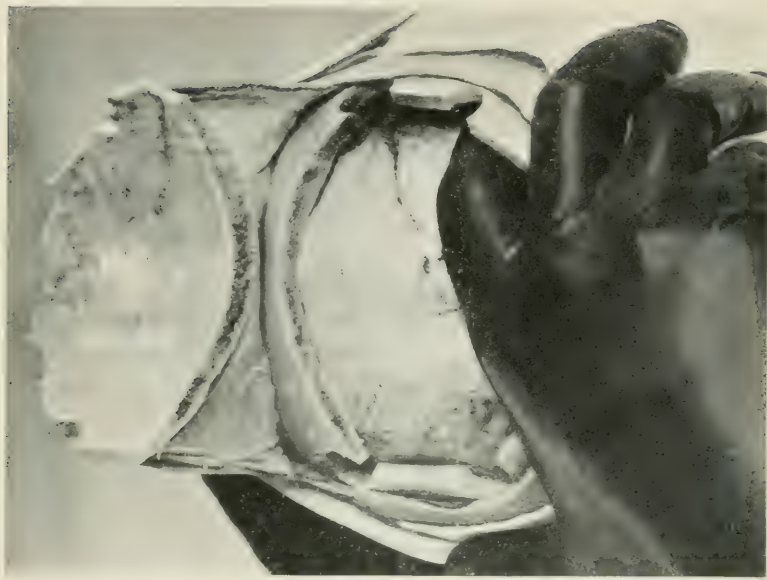
Method of using the electric saw, steel springs having been introduced from one trophic opening to the other so that the instrument may not injure the delicate tissues lying beneath.

FIG. 11.



Showing the access given to the detachable zone of Marchant.

FIG. 12.



Showing easy access to the most sensitive and active parts of the brain.

Doctor Jacob tells me that this craniotomy has a biological concept of cerebral decompression superior to the craniotomies known, and the only objection to the operation which he has, is the circulatory modification which might result from wounding and ligating the superior longitudinal sinus.

This objection must be considered in a general and special sense. *In general*, the freeing of this sinus is made spontaneously and without injury by elastic sounds, and care should be taken at the operation to avoid injury. This mishap should not occur, but at all events, experience teaches us that ligation of this sinus produces no disturbances. The only constant hæmorrhage at this operation is that of the emissary veins which are torn when the bone flap is raised and which is easily arrested by two fine ligatures with the needle. *In particular*, the dura is closely attached to this bony flap in craniums of early infancy. I have never performed this operation on such craniums but I have, on craniums of this age, produced the detachment of the flap indicated without tearing the venous sinus, obtaining afterwards by injection of a colored liquid, the proof that it was intact.

The osseous base of this flap has a line of spontaneous fracture in the fronto-parietal suture, a suture line which must be searched for at the extremities of the incision in order to open up well. If this fracture should require some effort, the inclination of the peduncle of the soft parts towards the median line (Fig. 12) permits us to make auxiliary trephinations, which make the fracture of the osseous base spontaneous and simple.

When this hinge movement of the skin-flap is carried out, the soft parts of the osseous base limit show a tendency to separate from the bony plate. In order to avoid this tearing of the soft parts from the movable bony plate, we previously separate these soft parts from the attached base of the frontal bone which is accomplished by tunnelization under its epicranium with straight Trélat tongues.

In Figs. 5, 7, 8, 9, 10, 11 and 12 we see the work accomplished by this craniotomy: The turned down flap shows a large opening in the bregma, the area on which the excentric pressure is more destructive and irritating. We see under the superior longitudinal sinus Trolard's and Labbé's veins, and under the parietal branches

of the middle meningeal artery, the greater portion of the area which is considered the most active of the brain. Figs. 11 and 12 show how this craniotomy gives a wide access to the whole margin of Marchant's detachable area.

This operation, if it is performed with a good technic, produces a large artificial fontanelle, as nature forms it, and permits of a very complete cerebral exploration without producing any shock and without exposing the life of the patient nor injuring the brain.

The details of a good operative technic are these: *Previous preparation* of the patient and of the region. Improvement of the conditions of coagulability of the blood, morphinization of the patient, preparation of the field of operation and tracing out the flap. This latter detail is important because it limits the area to be infiltrated by local anæsthesia and guides the previous hemostatic suture and doubles the margins of the wound.

The position of the patient at operation is indicated in Fig. 13.

The anæsthesia must be local, perfect and economic: Perfect and absolute in the area where we operate and economic in order to avoid useless infiltration, and the artificial cavities of the anæsthetics and the hæmorrhages and secondary accidents which an excess might produce. I use for my anæsthesia glass syringes with complete metal armature (Fig. 14).

As instrumentarium I use (1) electric trephines with central pyramids and limiting apparatus (Fig. 15); (2) circular saws, free and electrical, which work on limited areas by (3) elastic sounds (Figs. 7 and 10). Our elastic sounds are simply ends of watch springs with rounded and silvered ends (Fig. 15). In the same figure we see straight Trélat blades, which produce by tunneling on the frontal bone, detachment of its epicranium by avoiding its tearing off from the mobile bony plate, which is turned down on this bone.

In the lower part of this Fig. 15 is shown an instrument, which is sometimes useful in these operations. By noticing the direction of the sharp hooks of this instrument we shall understand that it is fitted to grasp the walls and bring the margins together, a true *approcheur*.

FIG. 14.

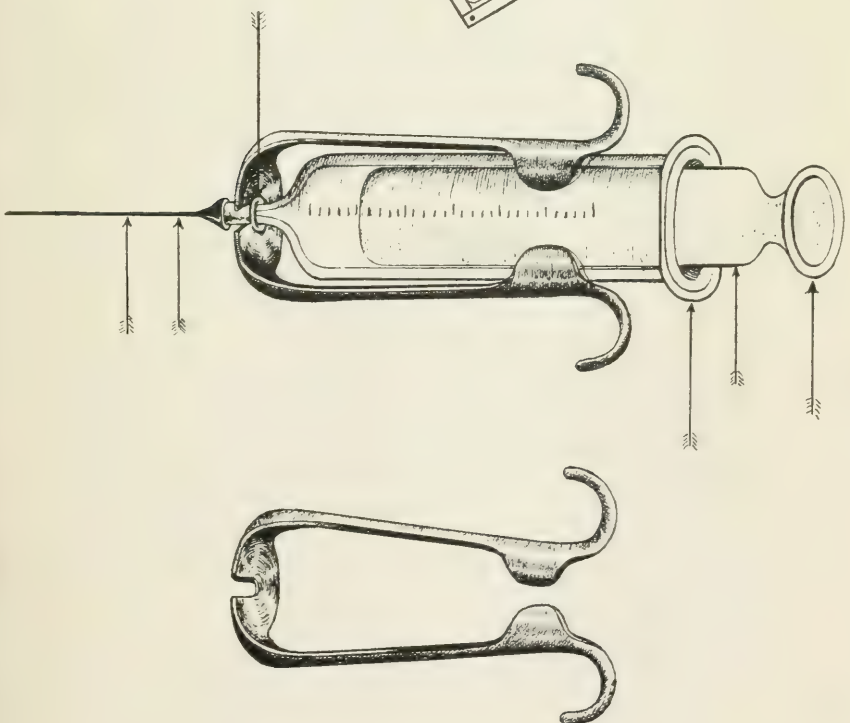


FIG. 13.



Position of patient in surgical chair at time of operation.

Glass hypodermic syringe with protecting metallic case.

The antecedents of this craniotomy are pathological, inductive and operative.

The pathological antecedents are all classical pathological fontanelles already mentioned and which are almost exclusively in this area and all the spontaneous dehiscences of the sutures of the cranium, which select also this region for their appearance.

The inductive antecedents are radiographic pictures of the crania of Doctor Carelli, which show in the middle of the indicated area, on the median line, behind the bregma, blotches, named after Doctor Carelli, which reveal osseous changes, mentioned in pathological anatomy, and which are, I believe, a sign of irritating and destructive phenomena of intracranial pressure on the sensitive surface of the flattened vault represented by the cranium.

I shall mention the operative antecedents of this form of craniotomy as I know them, both classical and modern.

(1) Crania of the Stone Age, of Feigneux, Topinard, Broca Museum, with a parietal, paramedian, surgical perforation, with marks of the instrument used in the operation.

(2) Crania of the Bronze Age with mixed median perforation behind the bregma, circular, cicatricized and with rectangular grooves without cicatrices (posthumous). Cranium of Lisières, Souche.

(3) Prehistoric crania of Peru with anterior parietal perforations of Mantegazza.

Broca believes that these trephinings were due to sectarian and superstitious mutilations. Jakob thinks that they were guided by a simple empiricism and that they trephined where they felt pain.

Among the modern precessors I should mention: The circular biparietal craniotomy by Dumont's median incision; the crucial biparietal of Wyeth, the lateral biparietal of Duret, and the purely frontal of Duret.

PATHOLOGICAL FRACTURE OF OSTEOGENIC FIBROSARCOMA OF FEMUR: OPEN OPERATION *

By LOUIS CARP, M.D.

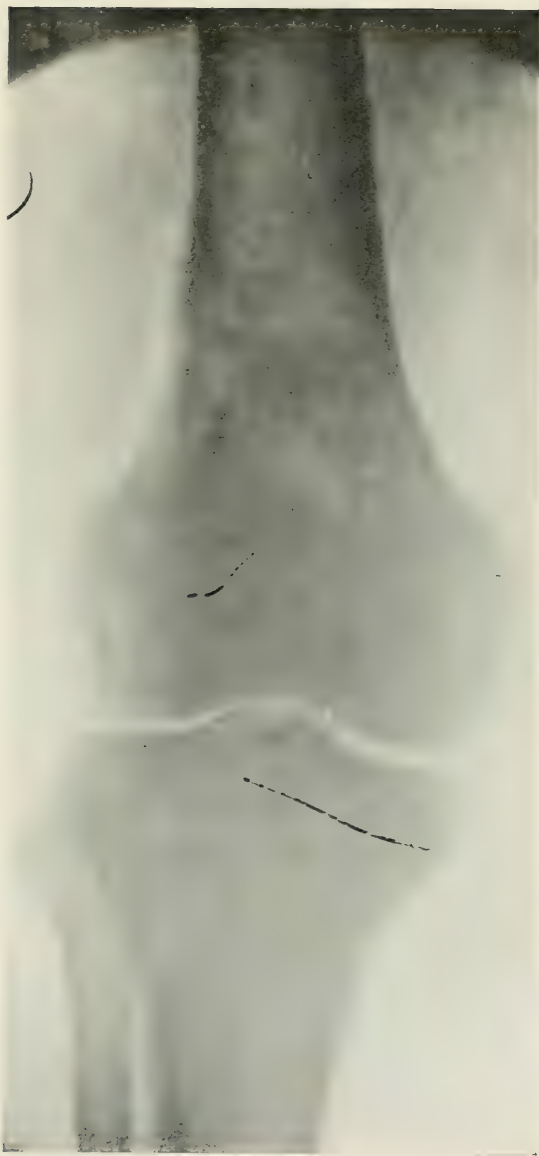
New York

I REGARD this case as of interest primarily from the standpoint of diagnosis. The question of future treatment is also a matter of concern.

The patient, a woman 41 years of age, presented herself nine months ago, complaining of pain in the right lower thigh region. Her past and family histories were irrelevant. On examination nothing abnormal was to be seen or felt. The only physical sign was tenderness just above the external condyle of the femur. X-ray (Fig. 1) showed a small area of rarefaction in the supracondylar portion of the femur with moderate periosteal reaction, but it had not extended into the true shaft of the bone. At that time I thought this patient might have a low-grade chronic osteomyelitis of the femur, or a medullary new growth. Syphilis, of course, had also to be considered although the X-ray did not so indicate. The patient was advised to go home and rest in bed and await the Wassermann report. She passed from observation and I did not see her again until three months later when she related the following: Three days after she first saw me, while walking in her apartment on a perfectly level surface, she suddenly fell to the ground, struck her right knee, heard and felt a crack, and could not get up again. She was taken to a hospital where she was treated with plaster-of-Paris cast and was discharged unimproved. This time three months later the patient presented an entirely different picture. There was tremendous tumefaction about the right knee. The patient could not walk, there was tenderness of the supracondylar portion of the femur, and shortening of one-half inch. From the history and findings, I suspected a probable pathological fracture which was shown

* Read before the Metropolitan Medical Society, November 28, 1922.

FIG. 1.



Area of medullary rarefaction, with some periosteal proliferation in lower end of femur.

FIG. 2.



Pathological supracondylar fracture sustained three days after FIG. 1 had been skiagraphed. (This picture was taken three months later.)

FIG. 3.



Large area of rarefaction with apparent sequestration, this picture being taken three months after Fig. 2.

FIG. 4.



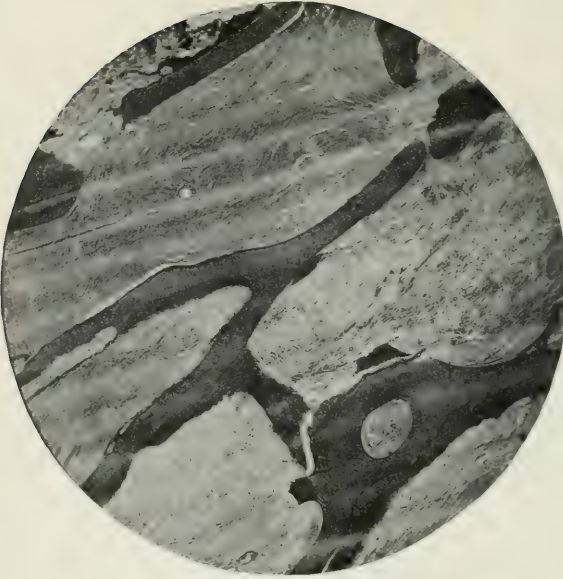
Lateral view of FIG. 3.

FIG. 5.



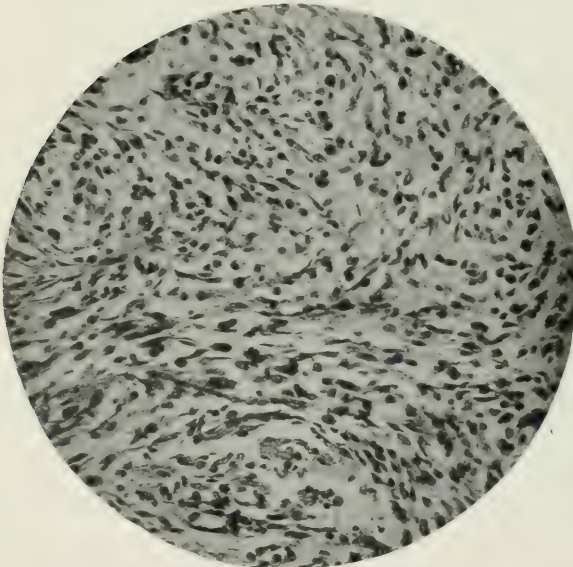
Taken six weeks post-operative to show lack of new bone formation.

FIG. 6.



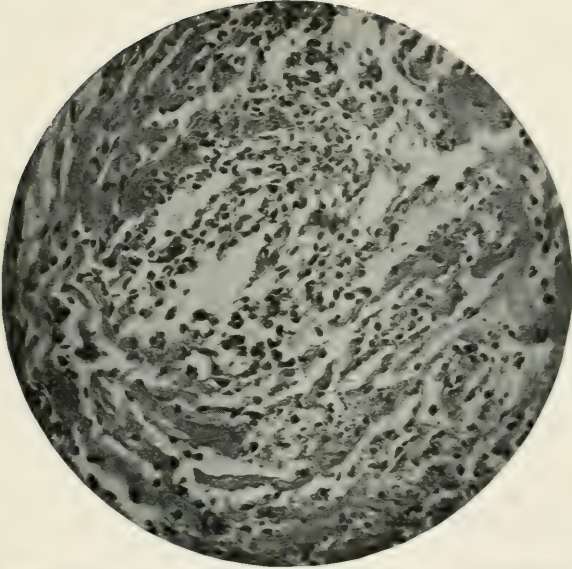
Showing almost complete collagen formation in bone substance—very few tumor cells in original section (upper left corner). (L. P. oc. 4, obj. 3.)

FIG. 7.



From actively growing part of tumor showing early collagen formation by tumor cells. (L. P. oc. 4, obj. 3; magnification, 100.)

FIG. 8.



Showing characteristic spindle cells and irregular arrangement (mitotic figures present in original section). (H. P. oc. 4, obj. 6.)

very clearly in the next röntgenogram (Fig. 2) where one can see an overriding supracondylar fracture of the femur through the diseased portion of the bone. The patient again passed out of my hands, and was hospitalized for thirteen weeks, being treated with extension and plaster. I was called to see her again last September about nine months after the inception of her trouble and six months after I first saw her. She presented no improvement. There were still tumefaction and tenderness and the patient was still bedridden. Another X-ray (Figs. 3 and 4) showed the following: This large area of rarefaction in the lower end of the femur which contained what I thought looked like a sequestrum. Having thought from the first that there was probably a chronic osteomyelitis, and the patient six months later showing what looked like sequestration, I considered that exploratory operation was indicated in order to remove the dead bone, and on September 16th, through a six-inch incision on the outer aspect of the thigh the muscle was exposed and found to be œdematous. On the bone the site of the pathological fracture was evident but to my surprise there was no sequestrum to be found. Just beneath the site of fracture there was a pearly white mass with a consistency somewhat firmer than cartilage. My first thought was that this was probably a sarcoma, but not knowing how malignant it was I gouged out what diseased bone I could and curetted until I got down to healthy tissue and sewed up the wound in layers with rubber dam drainage. I put the leg up in a Balkan frame with extension in a Thomas splint. In seven weeks she was discharged from the hospital unimproved, but the wound practically healed.

A specimen of the diseased material (Fig. 6) was submitted to the pathologist of the hospital for diagnosis. He was non-committal although he thought it was a fibro-sarcoma. The slides (Figs. 6, 7, and 8) were seen by three other eminent pathologists one of whom was in doubt; another thought it a myxosarcoma and the third committed himself to the effect that he had never seen anything like it before but believed it was an osteogenic sarcoma choked off by fibrous tissue and collagen. X-ray (Fig. 5) taken eight weeks after operation is interesting in that it shows that there has been

very little new bone laid down. The last X-ray taken a week ago seems to show a little more bone laid down. Urine, Wassermann, blood-count and X-ray of the chest are all negative.

This patient is presented before the Society because in the first place there was considerable discussion as to the X-ray interpretation; secondly because of the difference in the pathologists' opinions, and in the third place because I should like to seek advice as to the best judgment of the members of the Society whether to use conservative measures in treating this limb or proceed to immediate amputation.

DISCUSSION

DR. MARTIN W. WARE: At the last meeting of this Society there was considerable discussion regarding the interpretation of new growths and the application of radium and X-ray for their cure. This case of Doctor Carp's emphasizes anew the further need of arriving at some conclusion. The pathologists went very far apart in characterizing this new growth, and to predicate any treatment on any such doubtful grounds would be entirely amiss. The whole trouble arises in the giving forth of the dictum that radium and X-rays are of use in the treatment of "inoperable growths." Until the pathologists are in agreement in a given case we cannot give any credence to results of radium and intensive X-ray. I think Doctor Carp's case can be added to the large group where X-rays and radium are being applied without knowing in advance the pathological nature of the case. Nor can one rely on the statement of one pathologist merely when another one equally efficient holds a different opinion. Ewing has recently stated that there is a great deal of chaos regarding malignant new growths of bones; further evidence of this existing confusion is the questionnaire sent out by Bloodgood and Codman as to malignant growth of bones. The whole matter is doubtful regarding growths in all parts of the body and pathologists are at variance as to what is malignant. That is why one still hears that radium is efficacious in certain forms of new growth, and so we are told that radium should be applied in inoperable cases, if so why not as a substitute for operation? In

a Cancer Week meeting an eminent surgeon said that growths of the cheek have no good prospect of recovery after operation, but these growths yielded finally to radium. Yet, paradoxically, he would not recommend radium for operable growths on the lip.

DR. RICHARD LEWISOHN: I saw Doctor Hohlfelder in Frankfort, a few months ago. He told me that in sarcoma of the long bones only those cases had been definitely cured by deep X-ray therapy in which no exploratory incision had been done. I asked him how he was sure those cases had really been sarcomata. All microscopically proven cases of sarcoma of the long bones had died of recurrences or metastasis in spite of deep X-ray therapy.

DR. JOSEPH FELSEN: I think if any pathologist could look at that last picture he would not hesitate to make a diagnosis. From the first of the two sections it is impossible to make a diagnosis for all you can see is decalcified bone and a few tumor cells. But the other slide shows a neoplasm, the cells of which are those of spindle-celled sarcoma. One point ought to be brought out and that is that quite frequently this type of tumor which appears to clear up after local treatment may eventually terminate in late pulmonary metastases. Ewing in the article Doctor Ware referred to cites a number of cases where a local lesion has been cured but the patient died years later of metastasis of the lung.

DOCTOR CARP: I might say that it was the opinion of the pathologist most interested in bone tumors from what he saw in the slides that this *was* sarcoma and he definitely stated that he thought the patient was going to die no matter what was done. He strongly advised against amputation for the present but advised massive X-ray therapy. I am sorry none of the radiologists are here to-night to help us in the interpretation of the X-ray films. But looking back and knowing the pathological condition I think probably it is a little more evident that it is a sarcoma because it occurs in the lower end of a long bone, it is inclined to be spherical rather than cylindrical and it has not encroached on the cartilage. It probably is not carcinoma because that generally occurs near the nutrient foramen, generally in the shaft of the bone. I am still at a loss to

understand what produced the apparent sequestration. An article which appeared in the October number of *Surgery, Gynecology and Obstetrics* by R. L. Rhodes is interesting. He cites three cases in which there was osteomyelitis of a long bone on which there was afterward superimposed a periosteal sarcoma. I probably should have taken a culture but I did not dream this was anything but a new growth from what I found. In connection with Rhodes' cases Bloodgood said he had never seen a case of periosteal sarcoma in association with osteomyelitis.

HERNIA OF THE URETER: HERNIAL TUBERCULOSIS

By LEIGH F. WATSON, M.D.,

Associate in Surgery, Rush Medical College, Chicago, Illinois

HERNIA of the ureter or ureterocele is a protrusion of the ureter through a normal or abnormal opening in the abdominal or pelvic wall. Hernia of the ureter is very rare, and only a few cases have been reported in the literature. The ureter in a hernia is usually normal in appearance, and is especially likely to be so when it accompanies the bladder into the sac. The ureter is nearly always found in contact with a good-sized mass of fat.

There are two anatomical varieties of hernia of the ureter:

(1) The paraperitoneal variety, in which the hernia was in a peritoneal sac.

(2) The extraperitoneal variety, in which the sac is absent. In both varieties the ureter may be alone, or it may be accompanied by the bladder.

As a rule, the ureter lies extraperitoneal, behind the sac, and accompanies a hernia of the intestine or omentum.

From a clinical standpoint, hernia of the ureter is divided into two varieties:

(1) Hernia of the ureter alone;

(2) Hernia of the ureter with other viscera, usually with the bladder.

Berti (1911) collected 37 cases of hernia of the ureter, and in 19 the ureter was alone, and in 18 it was accompanied by the bladder. Brunner (1907) observed an isolated hernia of the ureter in which the loop was 8 inches (20 cm.) long.

Practically all of the recorded cases of hernia of the ureter have been caused by the ureter sliding into the sac in a manner similar to the slipping of the intestine into the sac, in a sliding hernia of the large intestine. Caccia (1909) found it very difficult to produce hernia of the ureter experimentally on the cadaver. He stated that it was much easier to make the ureter enter the femoral canal than the inguinal canal.

Reichel (1892) suggested as a possible cause of hernia of the ureter, the formation of adhesions between the ureter and testicle during intrauterine life, which resulted in the ureter being carried into the inguinal canal. No case of this type has been reported.

Extraperitoneal hernia of the ureter is probably congenital. The paraperitoneal variety may be due to an unobliterated peritoneal process which draws the ureter into the hernial canal either by traction on underlying tissues, or as a result of adhesion of the ureter to the posterior wall of the sac. When the portion of the bladder adjacent to the ureter is in the sac, it is usually due to traction exerted by the ureter.

A majority of cases of hernia of the ureter have been observed in subjects between 40 and 60 years of age. It occurs in both sexes with about equal frequency. Of 35 cases collected in the literature by Berti, 18 were in females and 17 in males. Hernia of the ureter occurs in the inguinal and femoral regions with about equal frequency. Berti found 19 of the inguinal to 16 of the femoral variety. The inguinal variety nearly always occurs in men and the femoral in women. Only 3 cases of inguinal hernia of the ureter have been observed in females, and only one case of the femoral variety in males. Hernia of the ureter alone is most frequently femoral, while hernia of the ureter and bladder is usually inguinal. Gelpke observed the only case of femoral hernia of the ureter and bladder that has been reported.

There are no characteristic symptoms and none of the reported cases have been diagnosed prior to operation. Sometimes there is a history of disturbances in urination. In the case observed by Ross and Taylor (1920), the patient had had frequent micturition for two years. Rarely there may be hematuria, and pain in the lower abdomen or lumbar region if there is a complicating hydronephrosis. The possibility of hernia of the ureter should be thought of when there is a hard, cord-like, incompletely reducible mass in the hernia canal, especially if it is associated with an empty sac. When the loop of the ureter in the hernia is very much dilated, the cystic tumor is dull on percussion, there is no gurgling when it is reduced, and sometimes the fluid can be felt as it is forced out of the dilated loop. Pressure of a truss pad on the ureter may result in a lessening of

the quantity of urine voided, and the removal of the pressure is followed by an increase in amount.

Cystoscopic examination and catheterization of the ureter offer the best prospect for a pre-operative diagnosis. When ureteral catheterization is possible, an obstruction is encountered in the region of the hernia. If the catheter passes through the herniated loop, it reënters the abdomen, and in case of hydronephrosis a large amount of urine is evacuated. X-ray examination with the catheter in the ureter will enable the examiner to make a positive diagnosis of hernia of the ureter. In the cases reported by Reichel and Meissner, catheterization of the ureter was impossible on account of stenosis. Hydronephrosis as a complication is not common.

Hernia of the ureter must not be mistaken for hernia of the appendix, hernia of Meckel's diverticulum, bladder diverticulum, hydrocele of the cord, adherent omentocoele and enterocoele.

If the ureter is identified before it is wounded, it should be freed and returned to the abdominal cavity. In femoral hernia, identification is usually very difficult. If the presence of the ureter is suspected, the operator should make an inguinal incision and look for the remains of the umbilical artery and in females for the round ligament also. In order to reduce femoral hernia of the ureter, it is sometimes necessary to cut Poupart's ligament, as in the cases reported by Bargi, Muscatello, Vivenja, and Oliva. If the ureter is wounded, it should be repaired by longitudinal or transverse interrupted sutures. When it has been completely divided, the ends may be united by end-to-end anastomosis, or by one of the methods used in general surgery for wounds of the ureter, or the distal end can be implanted into the bladder.

Caccia stated that implantation into the bladder is indicated when the ureter is considerably dilated and has lost the power of contraction. Rolando believed that the operation should always be done when the condition is complicated by a hernia of the bladder. When the ureter is thick, dilated or cannot be replaced in the abdominal cavity, resection is indicated. If the ureter is dilated, stenosed or diseased, the kidney on the affected side should always be examined for hydronephrosis, and if it is extremely involved, it should be removed, providing, of course, that the operator is certain

the other kidney is normal. If a fistula develops following a wound of the ureter, a second operation will be required to implant the ureter into the bladder. In Meissner's case, resection of the ureter was necessary because of the stenosis.

HERNIAL TUBERCULOSIS

Hernia tuberculosis is a term applied to tuberculosis of the hernial sac, its contents, or both. The first case was observed by Courtoise-Suffit and was reported by Baron in 1818; the second case by Pitha in 1845, Cruveilhier in 1862 reported 2 cases of tuberculosis of the sac and another in which both the sac and its mesenteric contents were involved. Later cases were reported by Hayem (1871) and Lejars (1889). In 1891 Jonnesco collected 11 cases in the literature; Antonelli (1899) found 80 cases, and Cotti (1906) was able to collect 136 cases.

If viscera are in the sac, the tuberculosis ordinarily involves both the sac wall and contents. In children the hernial sac is usually empty, and for this reason most of the reported cases in these subjects have been tuberculosis of the sac wall. In adults the sac often contains viscera, and in these cases both the sac and contents are generally involved.

Segre (1909) collected 167 cases of hernial tuberculosis in the literature and added 2 cases of his own. In 23 the tuberculosis was limited to the sac wall. Worobjew (1910) reported 40 cases of hernial tuberculosis, including 5 of his own. In 15 the disease was limited to the sac wall.

When the sac wall is the seat of tuberculosis, the entire peritoneal surface is usually affected. The involvement of only a portion of the sac is comparatively rare. Cases of localized tuberculosis of the neck of the sac have been reported by Brissaud, Guinon, Jonnesco and Remedi. Jonnesco (1891) and Mitchell (1902) reported cases in which only the fundus of the sac was involved.

The varieties of hernial tuberculosis are the same as those of the abdominal cavity. In fact, this condition is usually an extension from a foci of infection of the abdominal peritoneum, as fluid in the abdominal cavity gravitates downward early in the course of

the disease, infecting the hernial sac. There are three varieties, namely, miliary, ulcero-caseous, and fibrous.

The miliary form is the most common. The interior of the sac is studded with small miliary tubercles, which may be isolated or grouped close together. The sac nearly always contains more or less fluid which has the appearance of ascitic fluid. In fact, it often does come from the abdominal cavity and simply accumulates in the sac, which occupies a dependent position.

In the ulcero-caseous variety the sac wall is generally covered by a thick, tough membrane and often tuberculous granulations. Ulceration may develop and terminate in a tuberculous abscess. At this stage of the disease, if viscera are in the sac, they are involved by the tuberculous process.

The fibrous type of hernial tuberculosis is rare. It nearly always develops from the miliary or ulcero-caseous varieties, and generally represents the stage of healing—the so-called tuberculous cicatrix. The fibrous nodules or scar tissue are often extensively adherent to the sac contents, to the cord structures in inguinal hernia, and to the sheath of the femoral vein in femoral hernia.

Any abdominal viscera that enters a hernial sac may be affected by tuberculosis. The contents most frequently involved are omentum, mesentery, small intestine, genital organs and occasionally the large intestine. Blanc and Tisseraud observed a case of hernial tuberculosis of the cæcum.

Tuberculosis of the intestine is usually of the miliary variety. It may terminate in the ulcero-caseous form, and abscesses may develop between the intestinal coils, the omentum, and the sac wall.

Hernial tuberculosis of the omentum is seldom seen in children. Cases have been reported by Roth and Carle. It is frequent in adults and appears as small, diffuse tubercles scattered over the omentum. It has been compared to tapioca-like granulations. There is nearly always fluid in the sac, the amount depending on the severity of the infection. The omentum is usually adherent to the sac wall, but rarely to the intestine. Colle and Petit (1905) reported a case in which tuberculosis of the adherent omentum was mistaken for a hernial lipoma. A correct diagnosis was possible only after a microscopical examination.

Tuberculosis of the genital organs frequently coexists with hernial tuberculosis, and it is often the primary infection. Cases of tuberculosis of the Fallopian tube have been reported by Broca and Muscatella. Puech observed a tuberculous ovary. Broca reported a case in a man, in which the scrotal swelling contained a hydrocele, a cyst of the cord and a tuberculous hernial sac. Other combinations have been noted in which the peritoneal diverticulum was divided into loculi or partitions by the adhesions.

Multiple lesions are common in hernial tuberculosis. As a rule, omentum, intestine and sac wall are involved along with the testicle or ovary and tube. The abdominal peritoneum is involved more commonly than is generally supposed. In fact, it is the usual primary site of the infection, and is nearly always overlooked by the operator unless he has occasion to examine the intestine lying above the hernia or finds it necessary to open the abdomen to complete the hernia operation.

Hernial tuberculosis is usually due to an extension downward of abdominal peritoneal tuberculosis. It is an easy matter for ascitic fluid to gravitate downward, carrying tubercle bacilli into an open inguinal or femoral hernial sac. Primary hernial tuberculosis probably does occur as maintained by Jonnesco and Lejars. However, Morrison stated that it has never been demonstrated at post-mortem examination.

An extension of an abdominal tuberculous process is the most frequent cause of hernial tuberculosis (in 70 per cent. of the cases, according to Cotte) and genital tuberculosis is next in frequency as a cause. As in intestinal tuberculosis, the route of infection, when not by direct extension, is probably through the blood stream or the lymphatics as a result of metastases.

Hernial tuberculosis is much more frequent than the older statistics show. It is probably present in about 1 per cent. of all cases of hernia.

(All ages)	Total number of hernias	Cases of hernial tuberculosis
Velo	800	8
Sordina	500	5
Remedi	338	4
Cavazzani	1000	4

The percentage is highest in children. Morrison (1914) placed it at 2 per cent. It is somewhat lower in the aged and lowest in the adult and middle-aged.

In 121 cases collected in the literature by Cotte

Under 10 years	46 cases	
10-20	22 cases	
20-40	31 cases	
Over 40	22 cases	
(In children)	Total number of hernias	Cases of hernial tuberculosis
Broca	900	15
Coley	4571	26

Hernial tuberculosis is three times more frequent in males than in females. This is probably due to the fact that hernial tuberculosis attacks inguinal hernia more than any other variety, and this hernia is by far the most common in males.

The duration of the hernia and its size have no apparent bearing on the onset of tuberculosis. It has been found in hernias of all sizes.

Hernial tuberculosis nearly always occurs in inguinal hernia. In the cases collected in the literature by Cotte, the site was as follows:

Inguinal	87 cases
Femoral	11 cases
Umbilical	3 cases
Double inguinal hernia	16 cases
Double femoral hernia	1 case
Right inguinal and left femoral...	1 case

A careful history and thorough examination of the patient will nearly always demonstrate active or healed tuberculous lesions in other parts of the body. The lesions generally associated with hernial tuberculosis are visceral and abdominal, peritoneal, genital, including testis, epididymis, tube and ovary, pulmonary and laryngeal, and bone and joint. In 48 of the cases collected in the literature by Cotte, a previous history was obtained, and of these, 32 patients had had tuberculous lesions elsewhere in the body.

Hernial tuberculosis is conveniently divided into two varieties, painful and latent.

In painful hernial tuberculosis, attention is first attracted to the hernia by a severe and continuous pain, limited to the hernial tumor.

It is referred to the abdomen only in rare instances. The hernia tends to increase in size and become irreducible. Sometimes hard, irregular nodules can be detected in the sac contents. In infants and young children a congenital tuberculous hydrocele is often present.

The general symptoms of tuberculosis to be looked for are loss of weight, an evening temperature and night sweats. The presence of lesions in other parts of the body tend to confirm a diagnosis and the tuberculin test is helpful.

The latent form of hernial tuberculosis produces no symptoms and is seldom diagnosed except at operation.

The most frequent clinical varieties of hernial tuberculosis, according to Jaboulay and Patel, are hernio-peritoneal, hernio-testicular, and congenital tuberculous hydrocele.

In hernio-peritoneal tuberculosis, the principal symptoms—pain, distention and ascites—are referred to the abdominal peritoneum. The ascitic fluid in the sac can often be reduced into the abdominal cavity.

In hernio-testicular tuberculosis the process involves the testis, and also the epididymis in most of the cases. In the early stages, the testis is painful and indurated; later in the disease an abscess usually develops.

Congenital tuberculous hydrocele is frequent in hernial tuberculosis of infants and children. In its early stage it is often mistaken for an ordinary hydrocele.

The complications of hernial tuberculosis are local and general. The local complications are those common to all hernias namely, irreducibility, obstruction, congestion, inflammation and strangulation, etc. The general complications are tuberculous lesions in other parts of the body, in the abdominal viscera and peritoneum, genital organs, spine, bone, joints, lungs and meninges.

The diagnosis of hernial tuberculosis is often difficult, and unless the personal history is suggestive, or lesions exist elsewhere, it may be impossible except at operation. The ordinary conditions to be distinguished from hernial tuberculosis are non-tuberculous hernial peritonitis, epiploitis and benign or malignant growths in the sac.

The outlook for patients with hernial tuberculosis is grave. The local tuberculosis in the sac often clears up after operation, but the

patient usually dies from the effects of the primary lesion. In 27 cases of hernial tuberculosis in children reported by Morrison (1914), 3 patients died of general tuberculosis and 3 others ill—one with meningitis, and 2 with tuberculous enteritis. Many could not be traced.

The operation for hernial tuberculosis is attended with little additional risk, and the only contraindication to it is the presence of general tuberculosis, and even then operation is imperative, should strangulation occur. The reason for the grave prognosis in hernial and peritoneal tuberculosis is the marked tendency to metastatic extension to other portions of the body which results in death from abscess formation, pulmonary tuberculosis, meningitis, etc.

The treatment of hernial tuberculosis differs very little from that of hernias in general. Often extensive adhesions are encountered during operation, and it is sometimes necessary to leave a portion of the sac on account of inseparable adhesions between it and the cord structures, epididymis, testis, blood-vessels, etc. Omentum should not be resected unless the diseased area can be completely removed or unless it is required to deal with adhesions. If the tuberculous hernial contents are simply exposed to the air, improvement usually results and sometimes healing of the local condition. Peritoneal tuberculosis is nearly always present also, and should be dealt with through a second incision in the mid-line or lateral rectus region. If ulceration or stricture of the intestine has developed, resection of the gut is indicated. In addition to the operative treatment, the usual measures employed to combat tuberculosis are necessary.

CLINIC ON EMPYEMA

By RALPH BOERNE BETTMAN, M.D., F.A.C.S.

Assistant in Clinical Surgery, Northwestern University; Adjunct Attending Surgeon, Michael Reese Hospital, Chicago

WE have to-day two interesting cases of empyema, both in children. On both of these I am going to perform an air-tight thoracotomy and induce air-tight drainage.

This method that I am using is an adaptation of the air-tight method of drainage which was in vogue, especially among the French, many years ago, but which was later succeeded by the method of rib-resection and open drainage. During the war and in this country, due not only to our clinical experiences in the army camps but to the researches of the empyema commissions in the various base hospitals, the method of air-tight drainage has been reestablished.

As you know, the Empyema Commission being especially influenced by the work of Evarts Graham and Bell laid a good proportion of the ill-results which were experienced in the early days of our army empyema to the fact that an open pneumothorax had been induced before adhesions had formed. Graham and Bell claimed that the mediastinum offered virtually no resistance to pressure and that for all practical purposes the chest might be one single cavity instead of two. Because of this inability of the mediastinum to resist pressure both lungs would be collapsed by a one-sided pneumothorax, unless the mediastinal tissues were stabilized through pneumopleural adhesions.

Experience on the battlefields in France and in the operating room in civil life, where often large chest openings are made without the use of differential pressure, has shown that Graham and Bell's views must be greatly modified. However, there is no doubt that when the technic of air-tight drainage in acute empyema cases was adopted, the mortality rate dropped surprisingly. In summary our army routine may be described as follows: Early diagnosis, repeated aspiration of the chest for serous fluid, drainage for pus and Dakinization of the cavity. The experience in many of the camps showed that the air-tight drainage was the most satisfactory form of drainage.

There is another factor besides the avoidance of the slight collapse of the "sound lung," which is very important in explaining the success of the air-tight drainage, and that is, the resistance of the pleura to infection.

As you know, we have greatly changed our views regarding the susceptibility of the pleura, and we know now that the normal pleura has almost as great a resistance to bacteria, some authors go so far as to say greater, than the peritoneum. Moetzel has shown in animals that the suspension of staphylococci, which in other parts of the body would cause abscess formation, are well tolerated when injected into a normal pleural space. Amreich and Sparmann claim that the resistance of the pleura is due to actual bactericidal powers, to its great power of absorption, and also to the fact that the motion between the visceral and parietal pleura spread the infected material in a very fine layer over the pleural surface.

The resistance of the pleura we know is very greatly diminished in case of a pneumothorax; where a cavity exists the pleura seems to be very susceptible to infection. The exact reason is not very clear, but is probably due to many factors, some of which would apply to "dead spaces" in any other part of the body. By inducing air-tight drainage cavity formation is avoided, the layers of the pleura are approximated as soon as the fluid is aspirated. Thus by air-tight drainage we are helping to obtain natural pleural resistance to infection, and I think that this is a very important factor.

The history of the first case in brief is as follows: Six weeks ago this one-year-old child was in perfect health. He then developed a cough, fever and other symptoms which led to the diagnosis of pneumonia. After two weeks the child was better. The temperature was normal, but the parents claim that he was not entirely well. Later a cough started, the child became irritable, looked sick and for the last week has had a high temperature every afternoon. When I examined this infant last night he had a temperature of 101.6° F. He did not look very sick. Urine was negative. A white count showed 14,750 cells. Practically the entire right chest was flat on percussion. The heart was displaced to the left, and there was a definite paravertebral triangle of dulness on the same side. On the right, fremitus was absent and all breath sounds very distant in the lower and mid-

dorsal regions. The diagnosis of fluid in the chest, and most probably a purulent fluid, was readily made. An X-ray plate confirmed our physical findings.

Before preparing the child I am carefully percussing the chest again and will mark the site of drainage by making a very fine tracing on the skin with a sharp scalpel. This is painless and makes a visible sign which is not effaced by subsequent preparation.

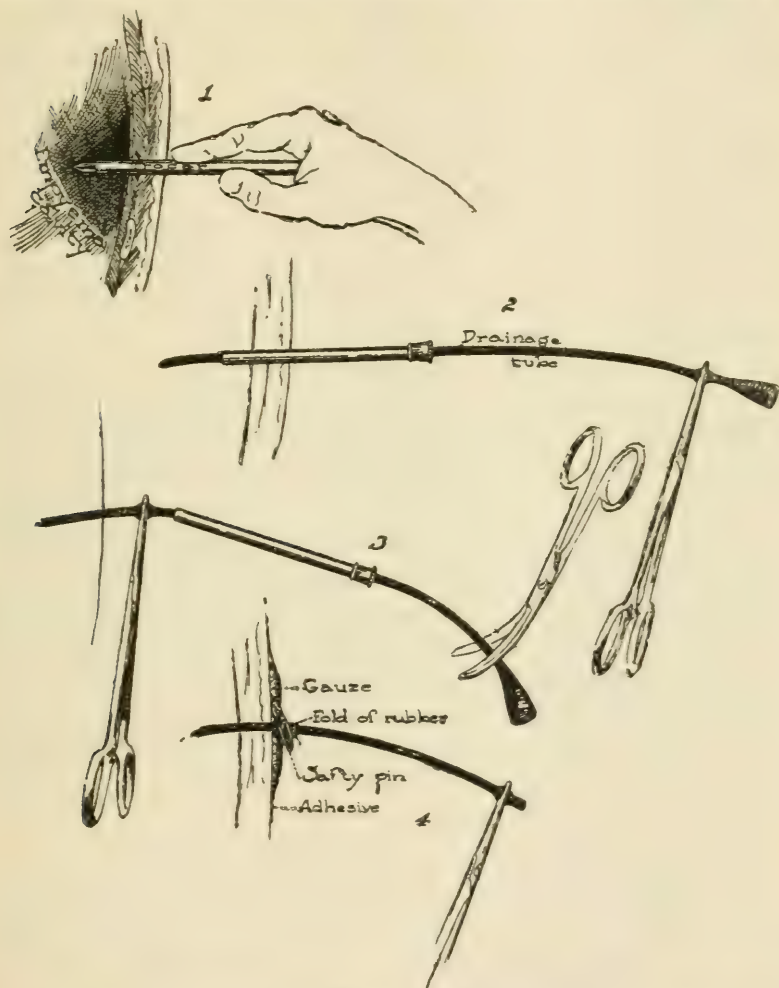
There has been much written about the site of drainage. The consensus of opinion is to establish it at the most dependent point. I think that is a wise rule, but I do not believe it is necessary to carry it to extreme. In my experience drainage in the ninth interspace in the mid-scapular line is very satisfactory. Chevrier has shown by work on cadavers that the space on either side of the vertebral column is the most dependent. He has even advised making an incision in the chest at what seems to be the most dependent portion, inserting a finger into this wound and actually palpating the diaphragm level. Then, if necessary, instituting drainage through a second thoracotomy made under guidance of the examining finger. I think this is rather carrying matters to an extreme. The patient inconsiderately will not remain in one position, but likes to turn on one side or another, thus shifting the dependent point. Most of the time they are lying on their backs anyway.

The method that I am using here is an adaptation of the method we used in the army. It has been used in this hospital for several years now and has given such good results and is so simple that I think it is well worth demonstrating.

The preparation of the skin consists of soap and water, alcohol, ether and iodine. In children I am very careful to use a dilute solution of iodine and then in order further to prevent burns, to clean off the dark margin with alcohol.

I am infiltrating the skin with one-half of one per cent. procaine solution. I now insert this long needle through the anæsthetized skin wheal and attach the 10 c.c. syringe which contains 2 or 3 c.c. of procain solution. This solution I force into the tissues as I slowly advance my needle into the chest cavity. I have now perforated the pleural space and will aspirate, thus absolutely clinching my diagnosis. I expect I will find frank pus judging by the history. If I

do I will proceed to establish drainage. If the fluid is serous I will simply aspirate. As you see, I am aspirating a fairly thick greenish yellow pus. Now keeping the needle in place I will infiltrate the



Method of introducing trocar into empyema cavity (Fig. 1); the drainage tube, a catheter, has been introduced into the trocar, and the distal end is clamped with forceps (Fig. 2); the rubber tube is then clamped at the proximate end, and the distal forceps and trocar removed (Fig. 3); and the tube again closed at the distal end and held in place by appropriate dressings.

intercostal space with more procaine solution. With a very fine scalpel I make a small stab wound through the skin at the site of the needle. I withdraw the needle and insert this trocar, trying as much

as possible to follow the same course I have taken with the needle. The end of the trocar is in the empyema cavity. A sterile catheter, which fits the trocar sheath so snugly that it must be lubricated with oil or glycerine before it can be inserted, will be threaded through the trocar the instant the obturator is removed. There, now aspirating through the catheter you see I obtain pus as before. The catheter is closed with a clamp so that no air gains entrance through the chest cavity. This whole procedure has been absolutely air-tight except for the fraction of a second which it took to insert the catheter into the trocar after the stylet had been removed. The Diedreich trocar which we used a great deal in the army, was fitted with a small rubber sac through which the catheter could be inserted, so that for not even a moment was the procedure anything but air-tight.

The widening end of the catheter is cut off, the trocar is withdrawn, a clamp being placed on the catheter near its emergence at the skin wound. In order to anchor the catheter I am slipping over a little rubber cuff. Through this cuff I can insert a safety pin. Two small strips of gauze are laid on either side of the catheter, the safety pin is laid on top. Another small square of gauze, a little larger square of adhesive with a perforation for the catheter complete my dressing. We now apply a binder with a hole in it through which the catheter protrudes and the little pocket on the outside in which we drop the long end of the catheter and the clamp.

No change in dressing will be required for about a week, and may be even longer. However, usually after this time pus and secretions do make their way out along the side of the catheter and then, of course, dressings must be changed.

The after-treatment in summary consists of the following:

(1) Aspirate through the catheter every two hours, removing never more than 100 c.c. of pus. Keep the end of the catheter always closed, either with a clamp or during aspirations with a syringe so as not to allow air to gain access to the chest cavity.

(2) After aspirating inject through the catheter 20 c.c. of Dakin's solution. Should the amount of pus obtained at aspiration be less than 60 c.c. inject about one-third as much of Dakin's solution as the amount of pus aspirated.

(3) The tube is kept in place and the routine continued until

smears taken on three successive days show the cavity to be sterile. The catheter is then removed and the wound closed with adhesive.

The patients are taken out of doors as soon as possible. Exercises to aid expansion of the lungs, such as the use of Wolff blow bottles, setting up exercises, etc., are used as soon as the patient is able to perform them.

Empyema cases must be under constant supervision of the physician. Any little rise in temperature must immediately suggest a possible walling off of septic material and interference with free drainage. Repeated, careful and complete examination by the attending physician must be the rule. Frequent X-ray plates are helpful in showing the progress of the case.

[A resumé of the post-operative course of this case shows that the temperature remained about 101° F. for three or four days, and then became normal and remained normal except for one rise on the seventh day. By the fifth day not more than 10 c.c. of fluid could be obtained at aspiration. On the sixth day the dressings began to be soiled and new dressings were applied. In changing the dressings at this time the tube slipped out and a slightly larger tube had to be inserted. On the fourteenth day three successive smears having shown the cavity to be sterile, the tube was withdrawn and the wound sealed. The patient left the hospital six days later in good health. Physical examination at that time revealed only a slight impairment in percussion in the lower right dorsal region and but a very slight diminution in the intensity of the breath sounds. These findings were probably caused by a slightly thickened pleura. The pus in this case had revealed the presence of the pneumococcus type four.

The second case was very similar to the one just presented, and inasmuch as the treatment used was practically the same, it is not considered advisable to go into further details.—EDITOR.]

THREE CASES OF TUBERCULOSIS OF THE KIDNEY *

By DANIEL N. EISENDRATH, A.B., M.D.

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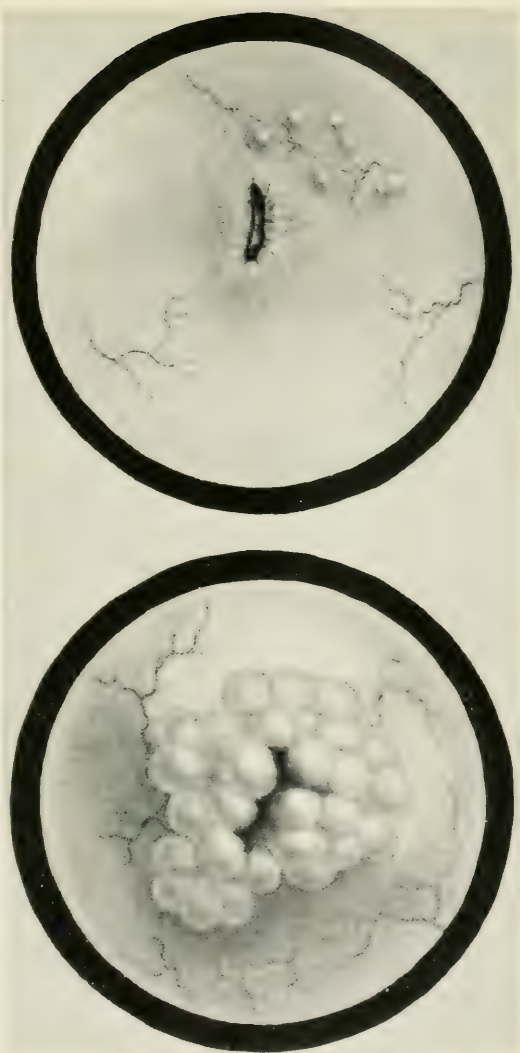
I WILL operate this afternoon upon two cases of tuberculosis of the kidney, and will also be able to present a patient upon whom nephrectomy has been performed six weeks ago for the same affection.

CASE I.—In the first patient, a young woman, the disease is still in its early stages, while in the other two there is complete destruction of the kidney, and in one of these, a young man of twenty-one (Case III) there was a complication present of a bilateral tuberculosis of the epididymis with unilateral involvement of the testis proper.

Status Præsens.—Our patient is a girl of twenty who was admitted to the medical service of Dr. A. A. Goldsmith six weeks ago complaining of pain in the right lumbar region of one month's duration. Three months ago she noticed that there was pain, increased frequency and urgency of urination. She was relieved temporarily by internal medication, but these bladder symptoms recurred in two weeks and were accompanied by chills, fever and sweats for a period of twenty-four hours, since which time she has had pain over the left kidney. This pain radiates downward along the course of the ureter and although dull and constantly present is subject to exacerbations during which it is quite severe. General physical examination reveals nothing abnormal except slight tenderness on deep pressure over the right kidney, but the latter cannot be palpated. The urologic examination reveals a right ureteral orifice gaping and surrounded by bullous œdema (Fig. 1). The urine obtained from the right kidney is purulent, but no acid-fast bacilli were found. Indigocarmin was present in the urine from this right kidney in fifteen minutes while from the left kidney it appeared in six minutes. The left ureteral orifice was normal in appearance and the urine from the left kidney was clear and showed no pathological changes. An ordinary röntgenogram revealed no abnormal shadows but a uretero-

* A clinical lecture delivered at the Cook County Hospital, January 10, 1923.

FIG. 1.



In the left-hand illustration is shown a typical gaping, rigid ureteral orifice as seen in tuberculosis of the kidney, surrounded by a number of submucous tubercles. To the right is seen an extreme degree of bulbous edema of the ureteral orifice as observed in Case I of to-day's clinic.

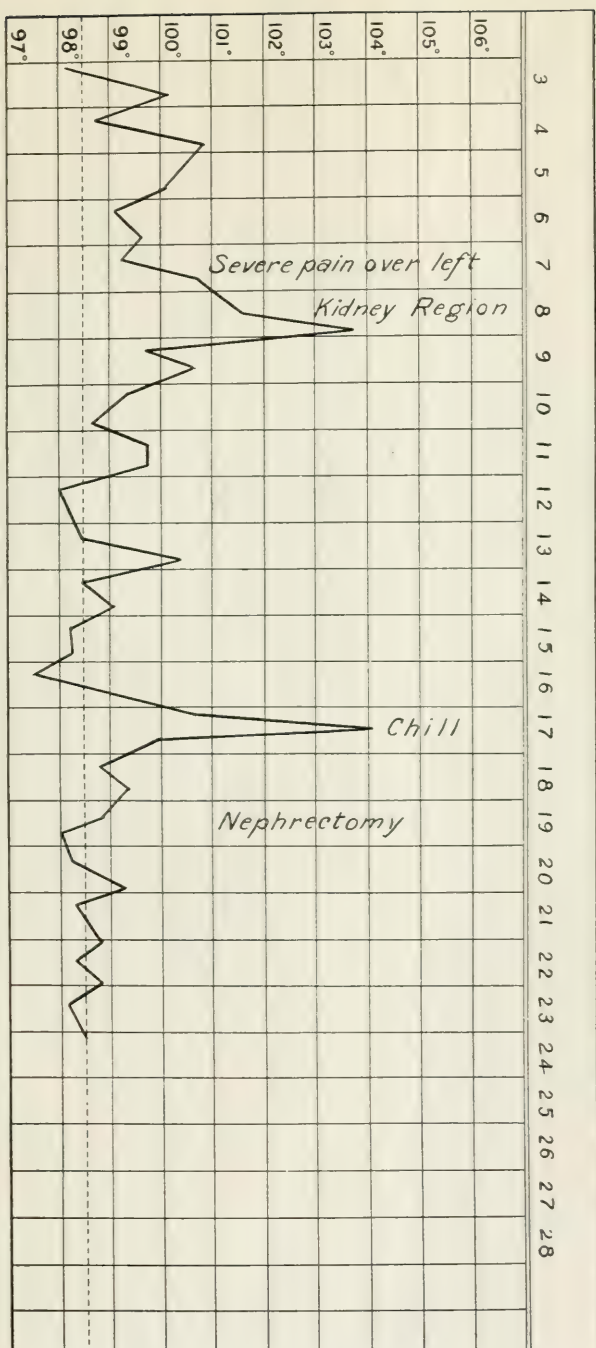
FIG. 2.



Pyelogram from Case I of to-day's clinic, illustrating changes due to tuberculosis. Note the normal appearance of the calyces of the lower half of the kidney in contrast to the widening of the shadow in the upper half and the ragged character of this outline.

Fig. 3.

Mixed Tuberculous and Pyogenic infection Case 227



Temperature chart from a patient with mixed tuberculous and pyogenic infection. The tuberculous was not suspected until a perinephritis abscess, known to contain *B. coli*, was opened, and tubercle bacilli discovered.

FIG. 4.



Specimen of tuberculosis of the kidney. Shows miliary tubercles on surface and on section, also many cavities. Surface shows example of lymphogenous spread. Pedicle shows beginning fibrous changes around vessels.

pyelogram made with 20 per cent. sodium iodide showed (Fig. 2) normal calyces in the lower half of the kidney, but a splash-like or imperfect definition of those of the upper half. The shadow of the ureteral lumen did not appear wider than normal.

A culture of the urine from the right kidney remained sterile.

The temperature has been normal during her stay in the hospital. The blood urea is 26.96 mg. per 100 c.c. of blood, that is, within normal limits, and the same is true of the creatinin in the blood.

Discussion.—We believe that we are justified in making a diagnosis of renal tuberculosis even though tubercle bacilli have not been found.

There is nothing pathognomonic of renal tuberculosis in the clinical history for exactly the same syndrome may be found in many cases of non-tuberculous (ordinary pyogenic) infection of the kidney. By this I mean that increased frequency, urgency and pain on urination followed or accompanied by cycles of chills, fever and sweats and pain over the kidney are frequently found in patients suffering from infection of the urinary tract due to staphylococci, streptococci and colon bacilli, that is, to other organisms than the tubercle bacillus. The same is true of the findings upon examination of the urinary tract, namely, swelling or bullous œdema around one ureteral orifice and turbid urine from the kidney of the same side. Presence, however, of sterile urine, although purulent, from the affected side makes one very suspicious of tuberculosis, that is, of the absence of the ordinary pyogenic organisms just enumerated.

If we were dealing with a case of mixed infection where the tubercle bacillus and one of the pyogenic organisms were both present one would not find the cultures sterile as in our case of to-day. If one finds the pyogenic organisms in culture or in smears from the urine it does not exclude the possibility of the case being one of mixed (tuberculous and ordinary pyogenic) infection. (Fig. 3.)

Finding, however, a sterile purulent urine on the right side combined with a pyelogram (Fig. 2) showing the changes characteristic of an incipient destructive process involving chiefly the upper half of the kidney and a bullous œdema (Fig. 1) limited to the right ureteral region, I am willing to make a diagnosis of renal tuberculosis even though we have been unable to find the tubercle bacilli and

in the absence of other bladder changes so frequently found in more advanced cases of this affection.

As our experience in kidney surgery increases we are learning that in the early stages there is a great similarity both in the clinical and urologic pictures between tuberculous and non-tuberculous (ordinary pyogenic) infections of the kidney. If it is desirable to make an early diagnosis of renal tuberculosis so as to increase the percentage of permanent cures, then it is of the utmost importance constantly to bear this similarity in mind, especially, as I have stated earlier in my lecture, on account of the cases of mixed infection.

I will now proceed to operate, and find that there are firm adhesions between the true and fatty capsule. Upon separating the two, a typical isolated tubercle presents near the lower pole and a large number of similar tubercles over both surfaces, especially of the upper half of the kidney (Fig. 4). The latter is not enlarged, but the ureter is considerably thicker than normal. I will not stop to describe the technic of nephrectomy, but shall discuss it briefly in connection with the other two cases. The kidney on section shows one moderate sized typical tuberculous cavity at the upper pole with several discrete incipient tuberculous cavities in the middle third of the kidney. The pelvis is but little changed. We are dealing, therefore, with an early tuberculosis limited to the upper pole, a diagnosis which, as you will recall, we were able to make before operation from the pyelogram (Fig. 2).

CASE II.—The second patient to be operated illustrates the similarity clinically of a destructive lesion in the kidney due to tuberculosis, to that due to the ordinary pyogenic organisms, for example, *B. coli*. The patient is a married woman, aged 23, who entered the hospital ten days ago stating that she had attacks of pain over the left kidney for the past three years. The pain is of a sharp cutting character most of the time and occurs at intervals of two to six weeks, lasting from one day to a week. It is usually located over the left kidney but occasionally radiates to the shoulder of the same side or along the ureter. She is obliged to urinate twice at night and about every hour during the day, a condition termed diurnal frequency. There is no increase in the frequency during the attacks of pain and no hæmaturia. She had a child eighteen

months ago, without complications. A diagnosis of left ureteral obstruction was made at another hospital six months ago. Since her admission ten days ago her temperature has varied daily from 100° to 103° F.

Physical examination was negative except for rigidity and tenderness over the left upper quadrant of the abdomen. There was marked tenderness on even light pressure over the left costovertebral angle—a characteristic location in renal infections. Palpation of the left kidney was impossible on account of the rigidity present.

The urologic study revealed a normal bladder but œdematous ureteral orifices. There was no obstruction to the ureteral catheter in both ureters. From the right side clear urine was obtained while no urine escaped from the left ureteral catheter, although washings from this side were turbid. The functional capacity of the right kidney as shown by color tests (indigocarmin) was normal.

Cultures made from the separate urines revealed the presence of *B. coli* alone on the right side and no growth in the cultures made from the urine of the left kidney.

A ureterogram did not disclose any abnormal changes except marked tortuosity. The pyelogram revealed large shadows evidently two of a large number of greatly dilated calyces (Fig. 5), but a complete filling of the pelvis was impossible.

I have found that quite frequently a pyelogram of a pyonephrotic kidney is imperfect because the entire kidney is converted into a series of sacs filled with thick pus. In order to secure a satisfactory pyelogram it is either necessary to allow most of the pus to escape through the ureteral catheter, which of course is impossible, or to employ some pyelographic medium which is not diluted by the pus present in the cavities. The intensity of the shadows cast by the media which we now employ for pyelography, such as sodium iodide and sodium bromide, is very frequently greatly decreased by the pus retained within the kidney so that the pyelogram only succeeds in showing us a few of the cavities as in our present case.

Operation on Case II.—Our pre-operative diagnosis in this case is a pyonephrosis of the left kidney, probably due to *B. coli* infection, although cultures made from the urine of this kidney remain sterile. This latter finding causes us to make a reservation of a possible mixed

infection such as I have spoken of earlier to-day. The absence of tubercle bacilli in the urine and of typical changes in the bladder (Figs. 1, 6 and 7) such as one frequently finds in tuberculosis of the kidney would lead one to think that we are dealing with an ordinary pyogenic infection alone. The persistence of the temperature and a more or less complete destruction of the left kidney as indicated by the pyelogram, and the fact that no urine was obtained from this side is an indication for operation.

We will now proceed to expose the kidney which is found to be about the size of the adult head with dense adhesions between the true and fatty capsules, a condition quite commonly found in tuberculosis of the kidney. On the surface of the kidney you will note a marked lobulation (Fig. 8).

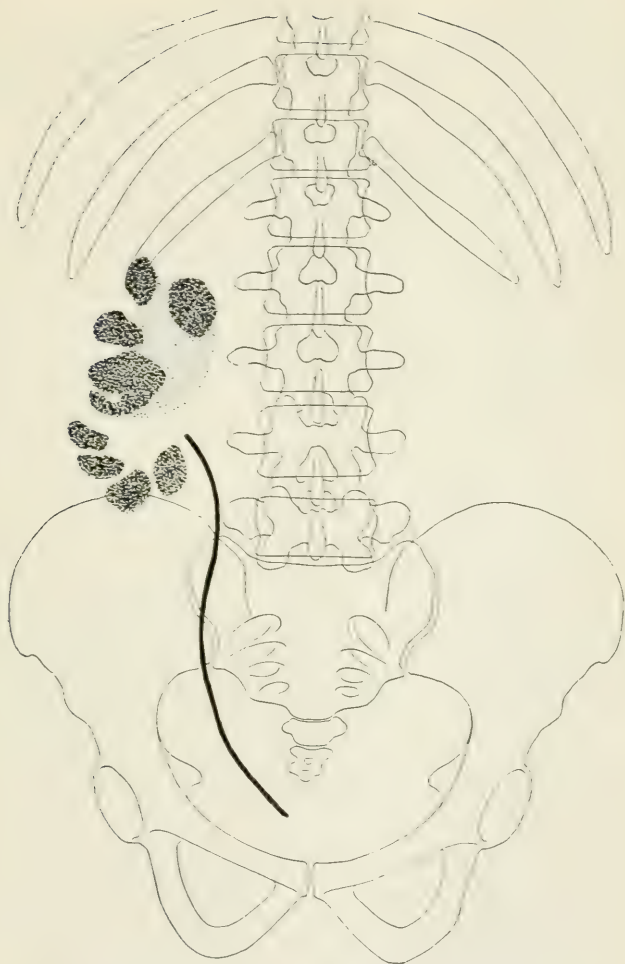
We will first ligate and divide the ureter which is only slightly larger than normal, confirming our findings in the ureterogram which showed the ureter tortuous but not much dilated. Having delivered the kidney we find it impossible to secure access to the pedicle without resorting to the technic of Federoff.¹ The fatty capsule is separated from the true capsule, allowing one to make an incision at the hilus of the kidney through the fatty capsule down to the vessels. On account of the huge size of the kidney we will apply clamps to the pedicle and ligate the vessels after removal of the kidney. I prefer kangaroo tendon as ligature material for the pedicle of the kidney since it is less apt to break at a critical moment than chromic catgut.

Having closed the incision in the parietes after inserting drainage at both the anterior and posterior ends of the incision, we will examine the specimen. The surface is markedly lobulated (Fig. 8), each one of these lobulations corresponding to a cavity containing thick pus. On section the kidney shows a condition similar to that seen in a recent case. There is scarcely a trace of parenchyma, the pelvis is greatly dilated and here and there are still to be seen cavities whose walls show the changes so characteristic of tuberculosis (Fig. 4).

This patient had symptoms indicative of a renal infection for three years and the condition of the kidney which we have just

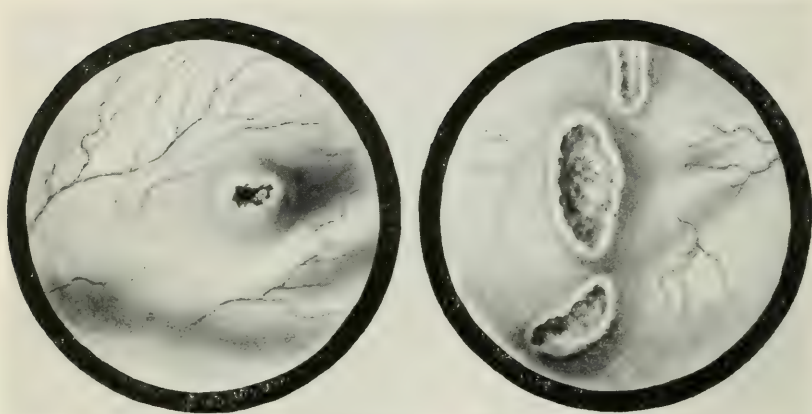
¹ W. J. Mayo, *Surg., Gyn., Obst.*, January, 1917, 24, 6.

FIG. 5.



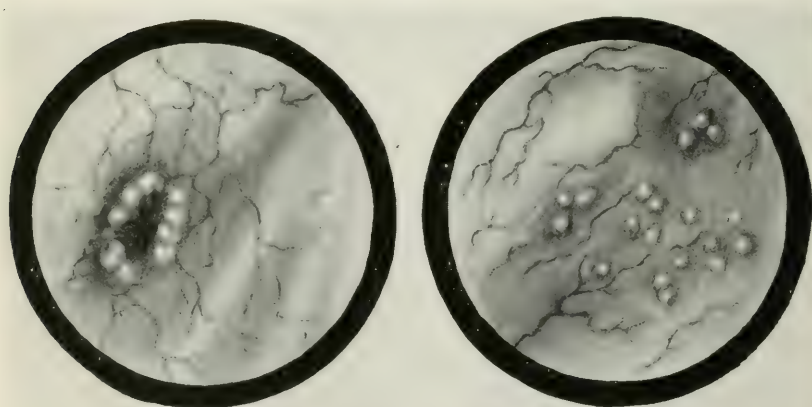
Tracing of pyelogram from case of tuberculous pyonephrosis. Note the scattered shadows due to retention of the pyelographic medium in the cavities within the kidney. In Case II of to-day's clinic only two such shadows were visible. (See text.)

FIG. 6.



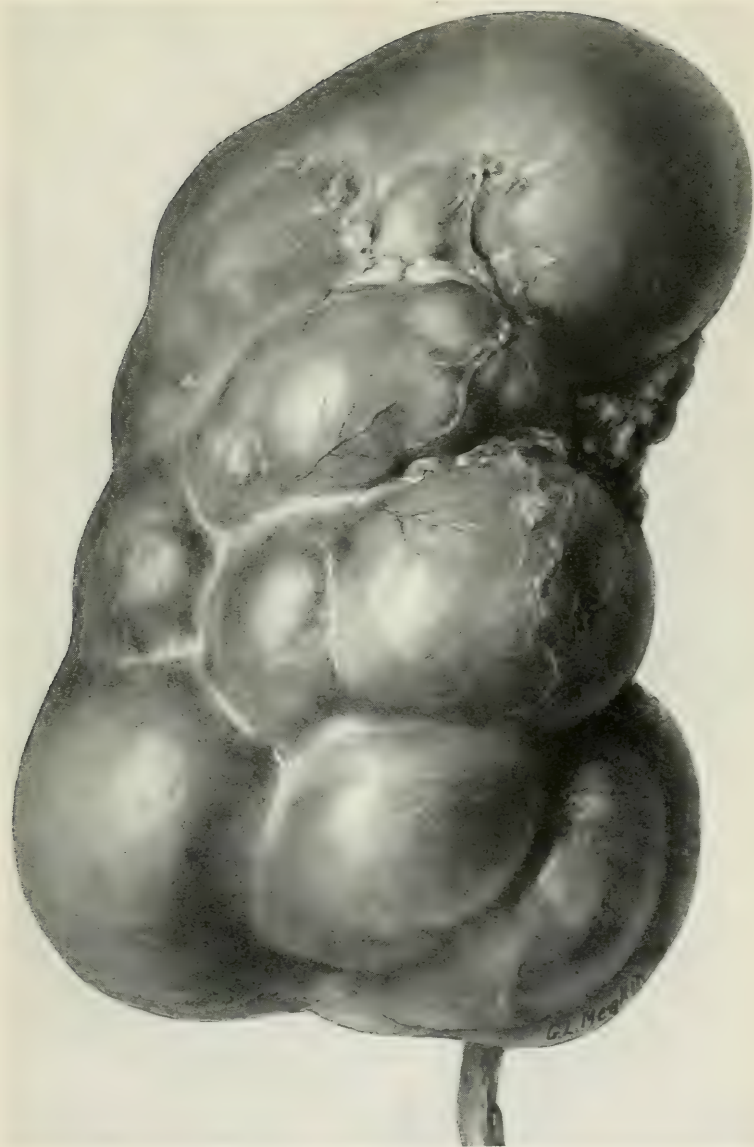
Typical single (on the left) and multiple (on the right) tuberculous ulcerations of the bladder as often seen in cases of tuberculosis of the kidney.

FIG. 7.



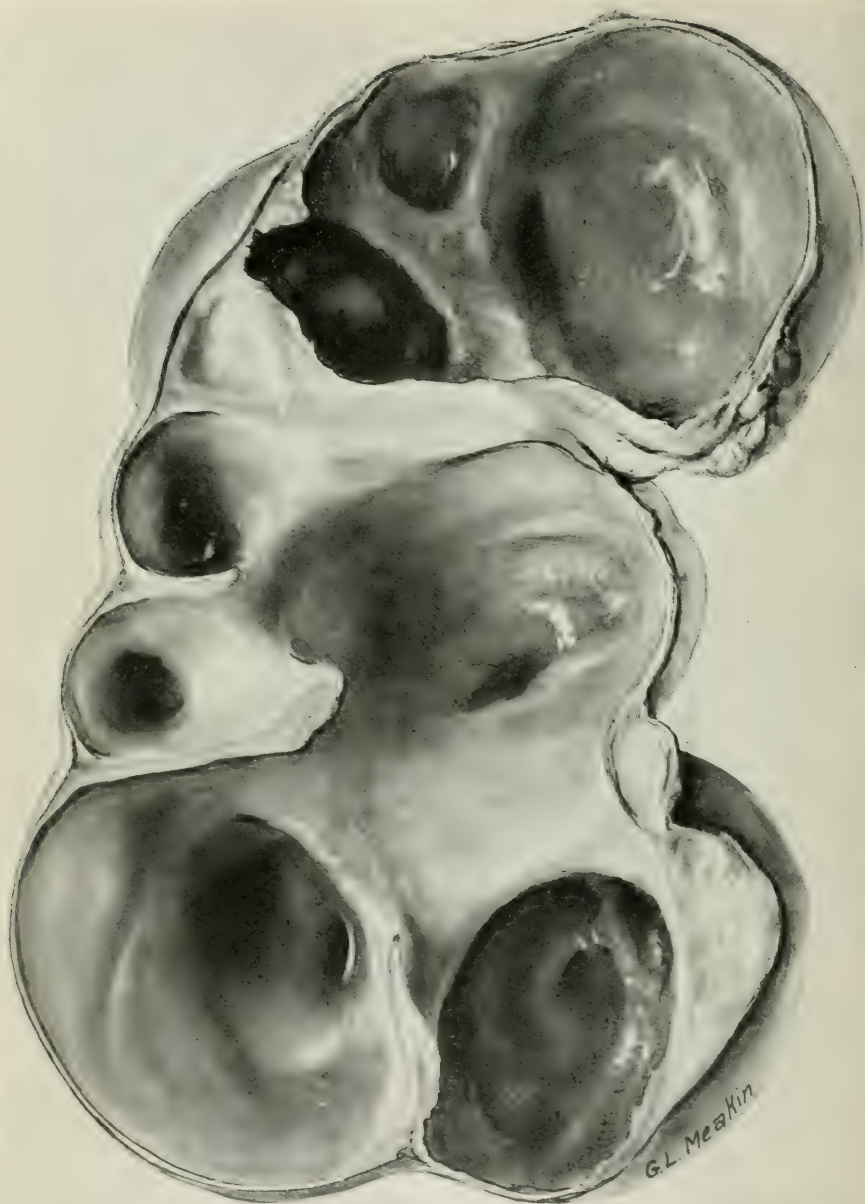
Tuberculous ulcer surrounded by miliary tubercles on the left, multiple submucous thickening of the bladder wall on the right.

FIG. 8.



Exterior of kidney showing advanced degree of pyonephrosis similar to that found at operation in Case II.

FIG. 9.



Section of kidney shown in Fig. 8, showing complete disappearance of parenchyma as result of tuberculosis.

removed shows that the destructive process has extended over a far longer period than was the case in such a kidney which was removed from the first patient whose symptoms had only existed for a few months.

If a diagnosis had been made in this second patient at as early a stage as we have been able to do in the first case, I feel confident that we would have less cause to be concerned about the condition of the remaining kidney which, although not involved as yet by a tuberculous infection, has been the seat of a nephritis due to the constant absorption of the toxins from the pyonephrotic left kidney. This is an important factor in making a prognosis when we operate upon cases of advanced renal tuberculosis.

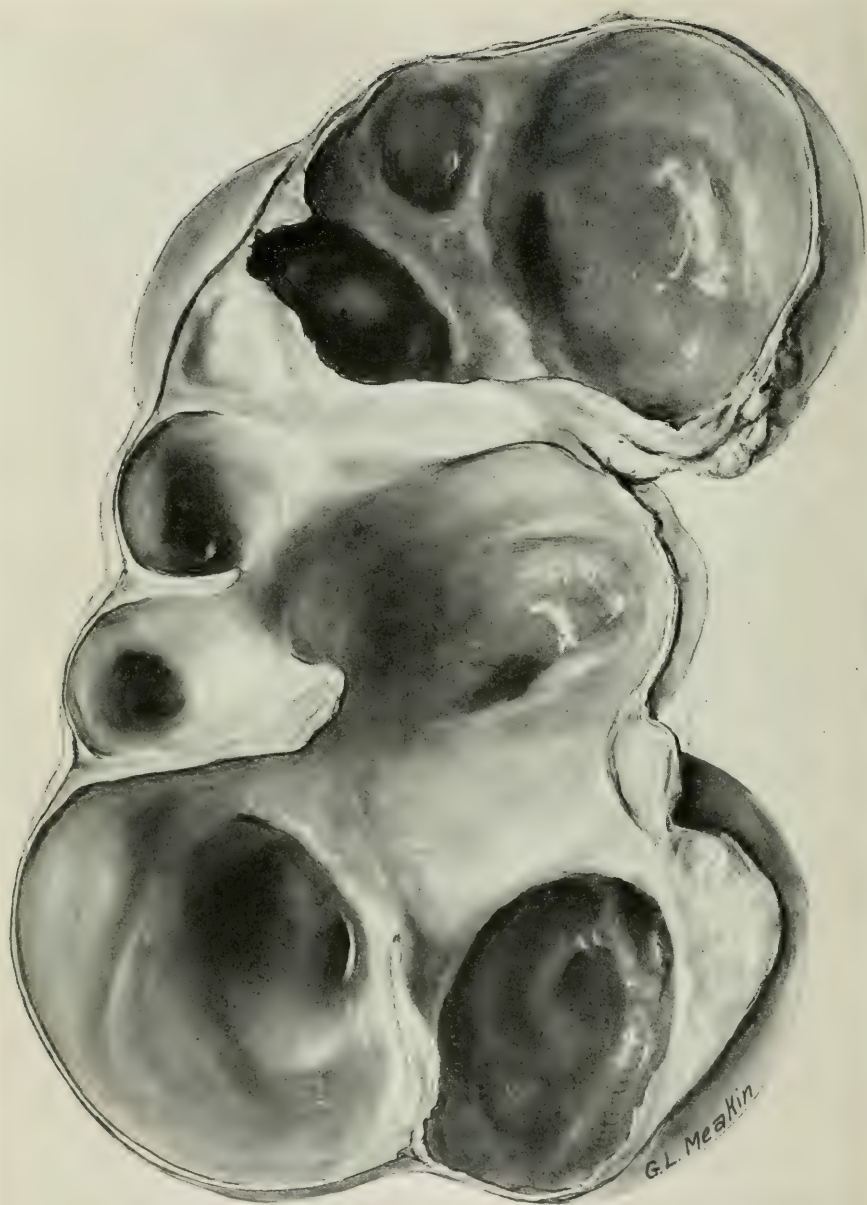
CASE III.—The result of procrastination in these cases is well illustrated by our third patient whose kidney we removed six weeks ago. He is 21 years of age and was first admitted to this hospital fourteen months ago complaining of increased frequency and pain on urination accompanied by hæmaturia at the end of the act. There was no enlargement of the epididymis at that time. Cystoscopy (Doctor Culver) revealed a right ureteral orifice which was gaping, retracted and œdematous, a combination so often seen in renal tuberculosis (Fig. 1). Catheterization of the right ureter could not be done. The left ureteral orifice was normal and the catheterization of the corresponding ureter revealed an apparently normal left kidney.

The record of this first admission (fourteen months ago) does not state why he was not operated upon at that time. Upon readmission about three months ago he stated that the urinary symptoms, that is, increased frequency and pain, had become more marked until he was obliged to urinate every hour during the day and almost as often during the night.

About three months before his second stay in the hospital he noticed an enlargement of the right testis. A little later a fluctuating red swelling appeared on the upper portion of the right side of the scrotum.

Upon admission two months ago a ragged typical tuberculous ulcer (Fig. 6) was found near the right ureteral orifice which now was very much retracted and gaping (Fig. 1). The left ureteral orifice did not show any tuberculous involvement. The urine from

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removed shows that the destructive process has extended over a far longer period than was the case in such a kidney which was removed from the first patient whose symptoms had only existed for a few months.

If a diagnosis had been made in this second patient at as early a stage as we have been able to do in the first case, I feel confident that we would have less cause to be concerned about the condition of the remaining kidney which, although not involved as yet by a tuberculous infection, has been the seat of a nephritis due to the constant absorption of the toxins from the pyonephrotic left kidney. This is an important factor in making a prognosis when we operate upon cases of advanced renal tuberculosis.

CASE III.—The result of procrastination in these cases is well illustrated by our third patient whose kidney we removed six weeks ago. He is 21 years of age and was first admitted to this hospital fourteen months ago complaining of increased frequency and pain on urination accompanied by hæmaturia at the end of the act. There was no enlargement of the epididymis at that time. Cystoscopy (Doctor Culver) revealed a right ureteral orifice which was gaping, retracted and œdematous, a combination so often seen in renal tuberculosis (Fig. 1). Catheterization of the right ureter could not be done. The left ureteral orifice was normal and the catheterization of the corresponding ureter revealed an apparently normal left kidney.

The record of this first admission (fourteen months ago) does not state why he was not operated upon at that time. Upon readmission about three months ago he stated that the urinary symptoms, that is, increased frequency and pain, had become more marked until he was obliged to urinate every hour during the day and almost as often during the night.

About three months before his second stay in the hospital he noticed an enlargement of the right testis. A little later a fluctuating red swelling appeared on the upper portion of the right side of the scrotum.

Upon admission two months ago a ragged typical tuberculous ulcer (Fig. 6) was found near the right ureteral orifice which now was very much retracted and gaping (Fig. 1). The left ureteral orifice did not show any tuberculous involvement. The urine from

the right kidney contained a large number of pus cells and tubercle bacilli while the urine from the left kidney was clear and normal without any acid-fast organisms. Phthalein appeared on the right side in fifteen minutes in small quantity, while from the left kidney 20 per cent. was excreted in the first fifteen minutes. Blood urea was low, 13.54 mg. per 100 c.c.

The right epididymis was greatly enlarged, hard and nodulated. The testis proper could not be distinctly felt because of a secondary hydrocele. Connected with this evidently tuberculous epididymo-orchitis was a fluctuating swelling, due to a spontaneous perforation of the caseating epididymis. The left epididymis was also the seat of a tuberculosis but the body of the testis appeared uninvolved.

At the first sitting six weeks ago I removed the right kidney. We were able to demonstrate the presence of an accessory artery to the upper pole to those who witnessed the operation. The clinical importance of such accessory vessels is not as fully understood as it deserves to be in spite of some recent articles² on the subject. If overlooked they may give rise to very unwelcome bleeding during or after the operations, since they occur in about 10 to 20 per cent. of all cases operated upon.

At the time of operating this third case I emphasized the necessity of mobilizing the lower and then the upper pole slowly and to palpate for accessory vessels before dividing the tissues on the mesial border of the kidney above and below the pedicle proper. The ureter was doubly ligated close to the kidney and divided with a cautery knife between the two ligatures; the distal end simply dropped back into the wound. On account of the size of the kidney and the shortness of the pedicle the very valuable two-clamp method of W. J. Mayo³ was employed. Two nephrectomy forceps grasp the pedicle as far as possible from the hilus and the kidney itself is then removed.

The kidney was twice the size of the normal organ. On the surface were a large number of miliary tubercles singly and in groups. A section revealed an advanced stage of tuberculosis, similar to that

² D. N. Eisendrath: "Clinical Importance of Supernumerary Arteries to the Kidney," *Ann. Surg.*, July, 1918; "The Relation of Variations in the Renal Vessels to Pyelotomy and Nephrectomy," *Ibid.*, June, 1920.

³ *J. A. M. A.*, 1915, 64, 953.

seen in Fig. 9. The pelvis was very small, but the ureter was greatly thickened and enlarged.

Two weeks later, we proceeded to remove both epididymi by a technic⁴ which I have recently described. On the right side we excised at the same time the area where the suppurating epididymis had become adherent to the scrotum. Unfortunately, the tuberculous infection had already extended into the body of the testis on the right side so that although we attempted to conserve the testis proper, we were obliged to remove it at a second sitting.

The young man has made an uneventful recovery from his nephrectomy and bilateral epididymectomy and right orchidectomy. The scrotal incisions have healed but there is a mild degree of tuberculous infection of the kidney which has greatly improved under deep X-ray treatments.

Complications in the form of involvement of the genitalia in the male occur in about 30 per cent. of cases of renal tuberculosis. Such an involvement of the epididymi and of the prostate is not the result of direct extension from the kidney by way of the bladder and urethra but due to independent hæmatogenous infection of the genitalia. It might have occurred even though the kidney had been removed when this patient first entered the hospital, but I feel that the chance of such a localization would have been greatly decreased if an early nephrectomy had been done.

These three cases illustrate the importance of early diagnosis if we wish to increase the percentage of permanent cures which is about 55 to 60 per cent. at the present time. In my next clinic we will take up the pathological and clinical aspects of the subject in general and compare the results of non-operative and operative treatment of renal tuberculosis.

⁴ *Jour. Urol.*, August, 1920, 4, 363.

INJURIES TO THE FOOT AND ANKLE

By P. B. MAGNUSON, M.D.

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SOME reference has been made previously in these CLINICS to the mechanics and injuries of the foot. To review briefly, the foot may be considered only from two standpoints, and they are weight-bearing and locomotion. It is a comparatively small part of the anatomy and yet carries the weight of the individual comfortably if mechanically and anatomically perfect. The longitudinal arch is placed in the foot for one purpose and one purpose only; that is: To give spring to the walk. The plantar fascia runs from the anterior and plantar surface of the os calcis forward in a fan shape and attaches along at the heads of the metatarsals, and is the bow-string which holds the bow of the arch in position. The scaphoid is the keystone of the longitudinal arch. The plantar fascia and the scaphoid maintain this arch in position. If one or both are disabled from any cause, the arch is weakened. It is desired here to make a very distinct impression of the difference between flat-foot and weak or painful foot.

A true, rigid flat-foot is seldom painful because it has fallen far enough so that the foot has reached a support, namely, the ground. The height of an arch has nothing whatsoever to do with the integrity of a foot. A patient may have a very high arch and yet have a very painful foot. Another patient may have a very low arch and at the same time no pain whatsoever in the foot. Pain is brought about by a weakening of the ligaments or an overload placed upon the ligaments. This overload may be placed as a result of a sudden change in occupation from a sedentary life to an active life where weights are carried, a sudden increase in weight or it may be caused by a weakening of the ligaments due to illness, toxæmia, infection or trauma.

The diagnosis of a painful foot should be, and is, a comparatively simple matter, if it is remembered that the weight-bearing line of

the body should fall from the anterior superior spine of the ilium through the middle of the patella and into the middle toe. If the weight-bearing line is thrown over towards the great toe or medially, then more strain is thrown on the bow-string of the arch, the plantar fascia, than should fall there. Therefore there is a tendency toward overstraining this fascia with consequent pain, and overstrain of the fascia gives certain symptoms. These are tenderness at its two attachments: One at the heel and at the heads of the metatarsals. Tenderness immediately under the instep at the middle or junction of the posterior and middle third of the fascia should not be considered as a symptom of overstrained plantar fascia, inasmuch as here the plantar nerve lays very close between the examiner's thumb and the bony tissues forming the tarsus and the heads of the metatarsals, and consequently this area is usually much more tender than other areas of the foot. To test the integrity of the plantar fascia pressure should be placed on the ball of the foot and the foot put in dorsal flexion strongly. The plantar fascia can be felt to pull tight and can be felt almost in its entire length up to just back of the heads of the metatarsals. In a weak plantar fascia no sharp edge will be felt, but even a plantar fascia in which a sharp edge can be felt, the sole of the foot under the arch may still be painful.

In examining the foot of the workman who claims to have been injured and claims to have pain in the arch as a result of a trauma, probably the most valuable diagnostic sign is pain at the attachment of the ligaments which support the scaphoid bone. The individual does not associate tenderness here with an injury to the arch because he does not know that this bone is the keystone of the longitudinal arch, but the examining physician knows that loss of integrity of the arch will force the scaphoid out towards the medial line of the body, thereby straining the ligaments which support it and these ligaments become tender from overstrain. Therefore, in a foot which is overstrained and in which the arch is weakened, one will find tenderness around the supports of the scaphoid. If the pronation has gone on to a point where the internal lateral ligament of the ankle is stretched and the posterior tibial and flexus longis pollicis tendons are stretched, tenderness may be found under the internal malleolus and behind it, and sometimes even crepitation of these tendons when an inflammation has set up. (Figs. 1 and 2.)

Any trauma applied to the dorsum of the arch of the foot will throw sudden strain on the plantar fascia and on the ligaments supporting the scaphoid and weaken them. If the strain has been sufficient to materially traumatize them, a weak and painful foot may result and the maximum of the pain may not appear for a number of days following the injury, especially if the individual is allowed to bear weight on this foot. Therefore, the fact that a man received a trauma to the dorsum of the foot and continued to work and complains of pain developing a number of days afterwards to such a point that it disabled him, should be considered a valid injury and should be treated as such.

The treatment is simple. If the overstrain has been severe, the foot should be put up in strong inversion, even strong enough to make it appear as a club foot. This allows relaxation of the internal lateral ligament of the ankle joint, of the flexor tendons which run beneath the scaphoid and internal malleolus to the plantar surface of the foot, takes the strain off the scaphoid supports and off the plantar fascia, and puts on the stretch the external lateral ligament and the peroneal tendons and overcomes the unnatural valgus position which a weak foot assumes and throws the weight-bearing line of the body over towards the outside or weight-bearing part of the foot. We have put many feet at rest in this position, which of course is the only position in which a cast should be applied to a foot, except in the case of club feet or pes cavus, and even in the cases that have been kept in casts for a number of weeks, have never failed to see the foot come down into normal position after weight-bearing was begun. On the other hand, we have seen them immobilized in a semi-prone position and have invariably noted that painful feet followed. (See Fig. 3, INTERNATIONAL CLINICS, p. 14, Vol. II, Series 30.)

After the cast is removed it is necessary to give the foot support. It has long been the opinion of the author that support of an arch should not be made with a metal arch support. It is true that metal supports will relieve the pain in a weak foot. The reason why it relieved pain of course is because it relieves the plantar fascia and scaphoid ligaments of overstrain and may sometimes cure because it inverts the foot and throws the weight on the outside weight-

FIG. 1.



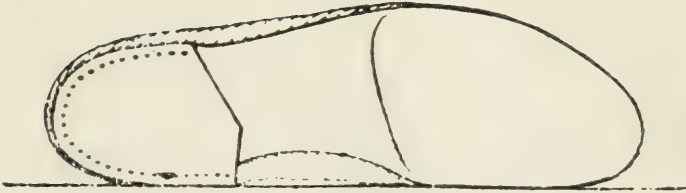
Traumatic flat foot. Note position of scaphoid and cuneiform in relation to astragalus and os calcis.

FIG. 2.



Left foot pronated; right foot normal.

FIG. 3.



Showing the so-called orthopædic heel which comes forward under the posterior part of the arch.

FIG. 4.



Strapping a foot with a weakened longitudinal arch with a felt pad in place under the arch.

FIG. 5.



Feet with a weakened longitudinal arch correctly strapped with a felt pad under the arch.

bearing part of the foot, but the cures are infrequent as compared with other methods of treatment. We do not cure a weak foot until we have reestablished the integrity of the ligaments and made them bear their normal weight and perform their functions without pain. This can best be done by placing a "dutchman" or a wedge on the *inner* margin of the heel, making the inner height of the heel one-eighth or three-sixteenths greater than the height on the outer edge. If necessary, add an extension in the way of a so-called orthopaedic heel which comes forward under the posterior part of the arch. (Fig. 3.) The shoe should be of such strength in the arch that a soft support may be put between the sole of the foot and the inside of the sole of the shoe that will hold this support without breaking down. Such shoes in these times are easy to procure. They have in them an arch of springy steel between the layers of leather which cannot be considered a rigid support in any way and which allows a proper spring in the arch. It has been found that piano felt cut in the shape of a wedge and strapped to the foot gives very satisfactory support and answers also as a constant source of massage as the patient walks, moulds into the arch of the foot and gives enough support to the weakened ligaments to relieve the pain, yet does not take away their entire work, and consequently strengthens them instead of relieving them of their full duties, and thereby causing their atrophy by disuse. (Figs. 4 and 5.)

In all injuries to the feet the surgeon should see to it that the patient has proper shoes even if a new pair must be procured; the sole of the shoe should follow in a general way the outline shown in Fig. 6.

The patient should then be instructed in the proper standing and walking positions. This is not as we have been taught in our school day and in the army, with the heels together and the feet at a 45-degree angle, but with the toes pointing in exactly the direction in which the patient is facing. When one considers the mechanics, it is easy to see why this is so. If one walks north and his toes and his feet are at an angle of 45 degrees, or one foot pointing northeast and the other northwest, his heel comes into the ground on its outer posterior surface and as he steps the weight of the propelling move-

ment falls on the ball of the great toe, which is the inside of the foot and the place where the arch is subject to the greatest strain; and consequently every time he steps and pushes forward with his foot, his toes on the ground, he throws more strain on the plantar fascia and on the arch than he should and adds constant insult to an already weakened member. Now it will be seen that if his toes point exactly in the direction in which he is going, he strikes the ground with his heel exactly in the middle and when the foot, which is giving the propelling motion, goes back, the weight of the body falls forward and is distributed equally over the ball of the foot and all five toes, which throws the major part of the weight on the outside of the foot where it should fall. (Figs. 7 and 8.) The patient who has been accustomed to walking with his feet at an angle, toes stretching outward, will have to be told to walk pigeon-toed. He then will stretch the external rotators of the thighs and contract the internal rotators voluntarily to bring his feet parallel. This is an unaccustomed position and he will feel as though his feet were turned in much more than they actually are. Until he overcomes the old muscle habit he will have to be constantly reminded.

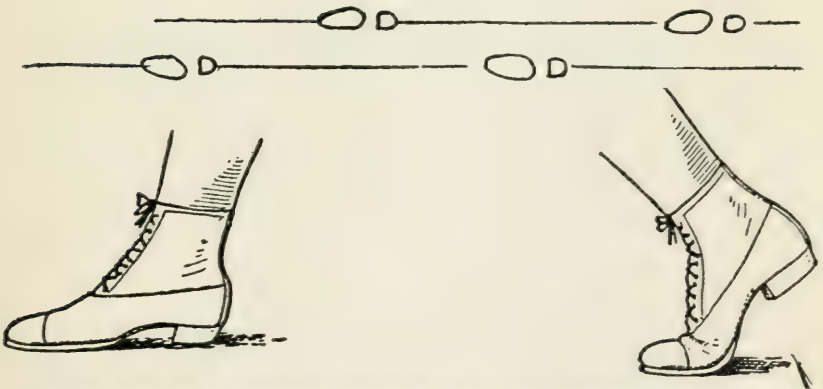
The building up of the inner margin of the shoe aids in this position and a shoe with a straight inner line and a bulging outer line with the toe swung in will also aid materially. Instruction should be given that when he is resting in a sitting position the legs should be crossed with the outside of each foot resting on the floor and the foot inverted. (Fig. 9.) He should be given exercises to perform daily which are aimed at strengthening the inverters of the foot and the integral muscles of the foot. These are principally standing with the toes together and the heels separated and raising on the toes and gradually increasing a number of times each day; flexion of the toes and inversion of the feet while sitting, and this can be best accomplished by having the patient attempt to pick small objects from the floor with the toes as he would with his fingers. If these few simple mechanical principles are followed in the diagnosis and treatment of injuries to the feet, a tremendous amount of disability may be saved to those who must be on their feet constantly in order to perform their duties.

FIG. 6.



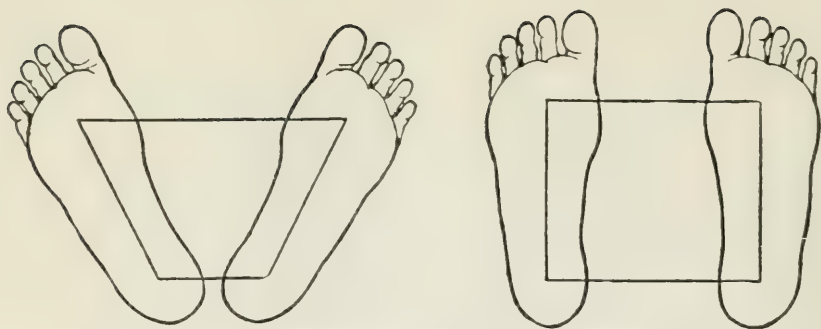
Proper shoes.

FIG. 7.



Showing correct way of walking—toes pointing exactly in the direction he is going, he strikes the ground with his heel exactly in the middle and the weight going forward is distributed equally over the ball of the foot and all five toes.

FIG. 8



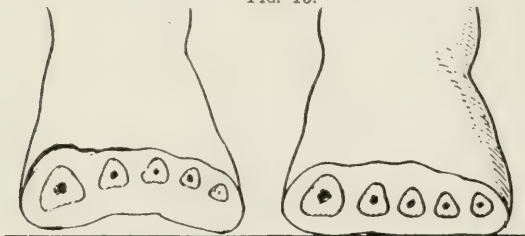
Showing incorrect (on left) and correct positions (on right) of feet in walking.

FIG. 9.



Position for weakened longitudinal arch. When resting in a sitting position the legs should be crossed with the outside of each foot resting on the floor and the foot inverted.

FIG. 10.



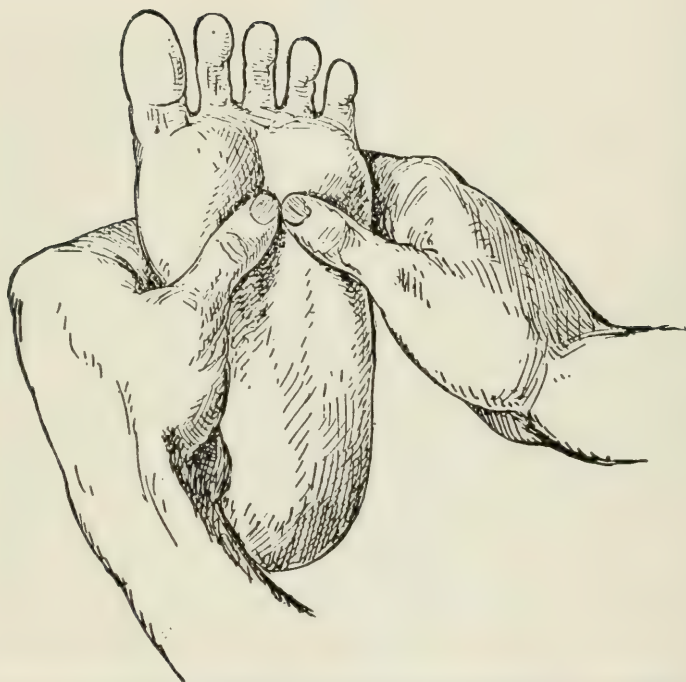
Shows the transverse arch of the foot.

FIG. 11.



Showing situation of pain in prolapse of transverse arch. The pain is probably caused by pinching of one of the plantar nerves as it passes between the heads of the third and fourth metatarsals.

FIG. 12.



Showing situation for placing of pad just behind the heads of the metatarsals transverse arch.

TRANSVERSE ARCH

The integrity of the transverse arch is as important to the comfort and weight-bearing ability of the foot as is the longitudinal arch and is as frequently prolapsed. The metatarsals forming this arch are dependent for their support on the integral muscles of the foot and the plantar fascia; also the fat pads which lay posterior to the heads of the metatarsals. (Fig. 10.) The symptoms of prolapse of this arch are pain usually radiating down between the third and fourth toes which is often extremely acute and necessitates the patient removing the shoe and putting pressure on the sole of the foot just back of the heads of the metatarsals. The pain is probably caused by a pinching of one of the plantar nerves as it passes beneath and between the heads of these two metatarsals, this being the weakest portion of the arch and practically its centre. (Fig. 11.) The patient also complains, if the arch is down and has been down for any considerable length of time, of a feeling of walking on the bare bones of the ball of the foot, and this condition, if allowed to exist for any considerable length of time, irritates the skin on the sole of the foot and develops callus at the point of greatest pressure. These calluses form one of the best signs as to how long the arch has been prolapsed.

The condition is easily relieved by placing a pad about one and one-half inches long and three-quarters of an inch wide and varying one-quarter to an inch thick, just behind the heads of the metatarsals. (Fig. 12.) The pad should be made of felt or leather and should be built up to a thickness which relieves the pain. We have seen some cases, especially in women, which could stand two full thicknesses of piano felt at this location before relief was obtained.

In workmen with severe prolapse of the transverse arch, especially following injury, it may become necessary to put on what is called an anterior heel, which is a strip of leather the thickness of the sole of the shoe which runs diagonally from the posterior margin of the head of the first metatarsal to the posterior margin of the head of the fifth metatarsal and is nailed to the sole of the shoe. Injuries to the ball of the foot or heads of the metatarsals are so frequent and apparently conditions under which they may be relieved so poorly understood that this point should be constantly kept in mind where

there has been traumatism to the heads of the metatarsals. This method will also relieve strain on the metatarsal-phalangeal joints where there have been fractures into the joint, inasmuch as the weight is thrown back of the joint and relieved the toes of full dorsal flexion in walking. It is our opinion that either a felt pad on thin leather insole placed inside the shoe or an anterior heel of leather nailed to the outside of the sole is essential in all traumatisms to the heads of the metatarsals when the patient first begins to bear weight.

SPURS ON THE HEEL

Our text-books call attention to the fact that spurs on the heel are due to gonorrhœa. We would like to add to this that spurs on the heel are due to any chronic low-grade infection whether it be from the urethra, the teeth, tonsils, intestines or elsewhere. The os calcis on account of its weight-bearing is subject to constant traumatism and consequently is a favorite location for a mild grade of periostitis and it is, also, our opinion that it is the periostitis which gives the pain more frequently than it is the spur. The accompanying illustration (Fig. 13) shows spurs not only on the heel but on the front and back of the astragalus. It will be noted that the spur on the heel points directly forward and we can see no reason for blaming the pain in the heel on the spur itself; unless the spur exists on the weight-bearing part of the os calcis there should be no irritation from it. The infection, however, which causes the spur is probably still existent and when this infection is cleared up it will be found that the pain in the heel will disappear.

The operation for the removal of spurs on weight-bearing surface of the heel should be approached with great degree of caution. The old incision on the inner surface of the heel was a poor exposure and one could only feel the support and chisel it off approximately. It therefore never has been a satisfactory operation. The one performed by the author is a complete u-shaped incision running from the calcaneo-astragaloid junction on the inside to the same junction on the outside, encircling the whole posterior surface about an inch above the plantar surface. This flap is reflected forward, the dissection being made between the fat and fascia. This will expose the whole lower surface of the os calcis and the support can be taken

FIG. 13.



Shows spurs not only on the heel but on the front and back of the astragalus.

FIG. 14.



X-Ray—case of a rupture of the tibio-fibular ligament—shows a fracture of the external malleolus with a complete separation of the tibia and fibula and an external dislocation of the foot on the tibia.

off with a sharp chisel at one blow, doing no damage to the fascia and not scraping the bone, which would have a tendency to roughen the periosteum and thereby cause subsequent formation of more spurs. The fat and weight-bearing skin on the bottom of the heel is not disturbed, can be placed back smoothly and there are no scars left where a weight-bearing surface occurs.

Attention has been called previously to the fact that under no circumstances should an incision be made on the weight-bearing part of the foot in any location. A scar is always a seam and a seam is always a painful thing to walk upon and can never be removed. If scars exist on the bottom of the feet then a removal of the weight by applying a felt pad at proper locations is the only way to relieve the pain.

RUPTURE OF THE TIBIO-FIBULAR LIGAMENT

Patient, M. S., age 25 years; occupation, brakeman; was thrown from the running board of an engine going at a speed of fifteen miles an hour. As he struck the ground with his right foot the foot caught between the tie rotating his body sharply with his leg straight. He felt a sudden, sharp pain near the ankle which was followed by immediate disability. It was found upon examination that the external malleolus was fractured, but in addition to this the fibula showed an abnormal range of motion. The lower end of the shaft of the fibula with the external malleolus could be moved between the thumb and finger back and forth over the outer surface of the tibia for a distance of one and one-half inches. The movement was smooth and without crepitus in spite of the swelling. The X-ray showed in addition to the fracture of the external malleolus a complete separation of the tibia and fibula with external dislocation of the foot on the tibia. (Fig. 14.)

Diagnosis of a fracture of the lower end of the fibula with a rupture of the tibio-fibular ligament was made. This is an extremely unusual form of injury. Apparently from the mechanics of this accident the ligament must have been ruptured first and then the patient received the eversion of the foot which fractured the external malleolus. A complete reduction of such an injury must be obtained since the integrity of the ankle joint depends on the mortis which

is formed by the tibia and fibula holding the astragalus between it. If this mortis is not firmly reëstablished and the ligaments which hold these bones in apposition allowed to heal in anatomical position, a permanent disability of the ankle will result. The foot and leg were put up in plaster with the foot at right angles and in strong inversion, the astragalus being pulled over snugly against the internal malleolus and the fibula forced in against the tibia with the external lateral ligament of the ankle joint, namely, the deltoid, pulled tight by inversion of the foot, holding the lower fragment of the fibula down in position. The foot was maintained in this plaster splint a full six weeks, which is not our custom in ordinary Potts' fracture, but it was felt in this particular instance that sufficient time should be allowed for firm healing of the ligaments and contraction of the internal structures of the ankle joint to assure a satisfactory result.

Progress of Medicine For the Year 1922*

THE WORLD'S UNREST

"Is not the whole world in the throes of a travail to produce something new, something perhaps better than we have ever known, which it may take long to perfect or achieve, but which, at any rate, means a new evolution?"

TEN years ago this prophetic quotation from Lord Rosebery's address before the Congress of Universities of the British Empire, held at London, in July, 1912, started the article on the Progress of Medicine for the Year 1912, in the first volume of the twenty-third series of the *INTERNATIONAL CLINICS*.

And what sort of a child has been brought forth to date as a result of the great World War in which potential Lysters, Kochs, Pasteurs, Oslers, and Gorgases may have been killed off and their beneficial work lost to posterity? Vice-president Coolidge in his address in New York City on February 7th of this year answers the question by declaring that

"There is by no means any reason to be discouraged. Rather is there every reason for faith and courage, and confidence in the increasing power of what is right."

Most persons will agree with the statement that during the past ten years abstract knowledge has increased by leaps and bounds, and that the results of investigations carried on in so many different fields of science may be used to retard as well as to advance our present state of civilization now on trial for its very existence. Here is a quotation from the London *Lancet*, of November 18, 1922:

"The *Soviet Red Gazette* announces that the Bolshevist authorities in one of the famine districts, 'for humanitarian and sanitary reasons,' have shot 117 children afflicted with glanders which developed after eating the flesh of horses suffering from that complaint."

Glanders is to-day practically unknown in England.

Have we, at least, learned our "unrest" lesson?

* Many topics not touched upon in this brief article have already been covered in recent issues of the *INTERNATIONAL CLINICS*, while other matters of interest to the medical profession will be taken up in forthcoming volumes.

RECENT ADVANCES IN MEDICINE

By COLONEL W. O. OWEN, M.D.,

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AND

MAJOR A. PARKER HITCHENS, M.D.,

Washington, D.C.

INSULIN

IN the whole field of medicine no development during the year has equalled in interest the reports from the Department of Physiology under the charge of Professor J. J. R. MacLeod and from the Department of Medicine under Professor Duncan Graham, both of the University of Toronto, concerning their studies upon diabetes. At this time there is good reason to hope that the internal secretion of the pancreas has been isolated in a state so pure that it may be used successfully for treatment. Whether or not treatment may result in permanent cure or whether it will be necessary to continue the administration of insulin, are questions still being actively discussed. It seems reasonable to think that the treatment of acute diabetes in young persons may result in permanent cure.

The person to whom credit is especially due for this work is F. G. Banting, a young physician shortly before released from the Canadian Army with which he had seen service in Europe. He states that while reading an article dealing with the relation of the Islands of Langerhans to diabetes the idea presented itself that since the acinous but not the islet tissue degenerates after ligation of the ducts, advantage might be taken of this fact to prepare an active extract of islet tissue. It occurred to him, furthermore, that the failures of other investigators in this much-worked field might be accounted for upon the hypothesis that trypsinogen or its derivatives were antagonistic to the internal secretion of the gland.

So long ago as 1884 Arnozan and Villard ligated the pancreatic ducts of rabbits and found that by the fourteenth day thereafter the parenchyma was mostly replaced by fibrous tissue. Sscobolew in

1902 confirmed this and noted further that while there was gradual atrophy and sclerosis of the pancreas, glycosuria did not develop until later. In from 30 to 120 days after ligation of the ducts there was involvement of the islets and glycosuria. Subsequently other workers furnished the experimental evidence which led to the generally accepted hypothesis that the islands of Langerhans are involved in pancreatic diabetes. Numerous attempts have been made to influence the disease by feeding pancreatic tissue and by administering preparations from the organ by other routes. None of these attempts were ever sufficiently successful to make them of practical value. As noted above, it occurred to Banting that the reason for failure was an antagonism between the zymogenic cells and those concerned with sugar metabolism.

The first extract was prepared from the pancreas of a dog, the ducts of which had previously been ligated under general anæsthesia.

The degenerated pancreas was quickly removed and sliced into a chilled mortar containing Ringer's solution. It was then completely macerated after being partially frozen by placing the mortar in a freezing mixture. The solution was filtered through paper and the filtrate tested upon depancreatized dogs. In the very first experiment it was found that injections of the fluid intravenously into the prepared dog markedly reduced the amount of blood-sugar.

Extracts were also made from fetal calf pancreas. The reason for this is that the pancreas of a fetal calf under five months does not contain pancreatic juice but does contain internal secretion. The fetal calf extract was likewise prepared by grinding in Ringer's solution and filtering. In order to obtain quantitative data, 50 gm. of tissue were ground with 250 c.c. of saline and filtered; and 15 c.c. of this solution diluted to 250 c.c. Of the diluted filtrate a dose of 15 c.c. reduced the percentage of blood-sugar in a 10-kilogram dog from 0.40 per cent. to 0.15 per cent. in three hours. About this time it was learned that subcutaneous injection gave a slower and more prolonged, but not less marked, fall in the percentage of blood-sugar than did intravenous injection.

Another important technical advance was the discovery that the active principle was soluble in alcohol. This led to the attempt to extract a whole normal beef pancreas. The viscus was removed immediately after the death of the animal and macerated in 95 per cent.

alcohol. After standing for twelve hours the filtrate was evaporated to dryness in a current of warm air. The residue redissolved in saline and injected subcutaneously into a diabetic dog caused the percentage of blood-sugar to fall from 0.35 to 0.08 in three hours, and the urine became sugar-free.

Better methods for preparing extracts are constantly being found. The practical value of the extracts in actual treatment having been demonstrated, production on a commercial scale became the next step. In order that the work might be controlled and for the protection of the public, patents have been applied for. According to the present plan, when methods for producing extracts on a large scale have been worked out successfully, manufacturing firms will be permitted to produce them, probably under license from the University of Toronto.

The rate of action of various lots of insulin varies when injected subcutaneously into dogs. It therefore became necessary to establish a basis for physiological assay. And it is considered that one unit is the number of cubic centimetres which causes the blood-sugar of normal rabbits to fall to 0.045 per cent. within four hours. Such a dose is decidedly active in lowering the blood-sugar in diabetic patients. When the blood-sugar of rabbits is reduced to this point a great majority of them exhibit convulsions. The earliest symptoms noted under such circumstances are signs of hunger and thirst, hyperexcitability and apparent fear. The animal may recover from these earlier symptoms but frequently with active preparations the hyperexcitability becomes extreme and clonic convulsive seizures involving the entire body and lasting for several minutes supervene. Subcutaneous injections of dextrose restore such animals to a condition approaching the normal, the dextrose acting as an antidote for an overdose of the extract.

Among the possible available sources for insulin are certain fish. Investigations made by MacLeod upon the pancreas of the dogfish and the skate have been encouraging. By the technic used it was found that from the pancreas of one barn-door skate weighing from 15 to 16 kilograms, 3 to 4 units of insulin could be prepared and active preparations were also obtained from the pancreas of the dogfish. Still more encouraging were the results with the "angler"

and the "sculpin," and since these are readily available fishes they may serve as a practical source of insulin.

The numerous clinical observations already made have given distinctly encouraging results. Naturally much remains to be learned concerning dosage, intervals between doses and the length of time treatment must be continued. The extracts are administered subcutaneously. They cannot be given by mouth since the active principle is destroyed by the digestive enzymes.

The first patient was a boy 14 years old suffering with diabetes of about two years' duration. Previous to admission to the Toronto General Hospital he had been starved without evident benefit, and during his first month in the hospital careful dietetic regulation failed to influence the course of his disease, which was one of severe juvenile diabetes with ketosis. He was admitted on December 2, 1921, and the first extracts were given on January 11th. These were not so concentrated as those used at a later date so that beyond a slightly lowered sugar excretion and a 25 per cent. fall in the blood-sugar level there was no evidence of clinical benefit. With the exception of the 25th and 26th, daily injections were made from January 23d to February 4th and these resulted in immediate improvement. The excretion of sugar became much less and acetone bodies disappeared from the urine. The boy became brighter, more active, looked better, and said he felt stronger. No extract was given from February 5th to February 15th and during this time sugar again appeared in the urine in large amounts along with traces of acetone. Administration of extract after this again resulted in lower sugar excretion and the disappearance of acetone from the urine.

"Although the other six patients treated by these extracts were all favorably influenced by its administration, particular reference might be made to one—a severe case who had been excreting 20 gm. of glucose on a diet containing 10 gm. carbohydrate and 2400 calories per day. Following injection of the extract his urine became sugar-free, and he obtained complete relief from severe depression and extreme lassitude. Respiratory quotients in this same case showed a definite rise after injection of the extract, confirming the increased utilization of carbohydrate.

"All patients were improved clinically. It is difficult to put in words what is meant by clinical improvement. Those who have been treating diabetes will have recognized as early signs of improvement a certain change in the skin, the appearance of the eyes, the behavior of the patient, his mental and psychic activity, and the physical evidences, as well as his testimony of increased vigor and desire to use his muscles." (Banting, Best, Collip, Campbell, and Fletcher, "Pancreatic Extracts in the Treatment of Diabetes Mellitus," *Canadian Med. Asso. J.*, 1922, **12**, 141-146.)

STANDARDIZATION OF THE WASSERMANN REACTION

Early in the year Kolmer¹ published what may be considered the culmination of six years of continuous investigation in his work of evolving a standardized Wassermann technic. That he fully realized the difficulties before him at the outset of the work is evidenced by the following quoted from the first paper in the series. The program then laid down "was to become acquainted with all existing methods by thoroughly reviewing the available literature and by means of personal communications and interviews with a large group of serologists and submitting the whole to careful, unbiased experiment and choosing that proving best on the basis of actual trial.

"Realizing the complex nature of the Wassermann reaction and the variable properties of its several biological reagents, our almost complete ignorance of its mechanism and the absence of a specific and wholly satisfactory antigen, the task of even attempting standardization was considered a serious and laborious problem; knowing that the majority of serologists had an individual way of conducting certain steps in the technic and particularly that many had learned from experience to rely so firmly upon their own method as to be very loath to accept any other, the hope of building up a widely acceptable technic would appear almost hopeless unless an indisputable quality of excellence."

Step by step, he and his students have studied the influence upon the result of variations in each of the elements concerned in the test

¹"Studies in the Standardization of the Wassermann Reaction," xxx, *Am. J. Syphilis*, 1922, **6**, 2-32.

and one after another a standard technic has been evolved for each procedure and each reagent. He believes that he has gone far in fulfilling the essential requirements of a standard technic; these are summarized as follows: "(1) As high degree of sensitiveness as is permissible with specificity; (2) practical specificity; (3) technical accuracy and uniformity in results; (4) yield a quantitative reaction; (5) simplicity in technic; and (6) economy."

To give the various steps to be followed in the quantitative test and in the qualitative test would be insufficient without repeating likewise the methods for preparing and titrating the various reagents. Persons interested and desiring to use the Kolmer method must consult the original paper. That this work is of a kind deserving the highest commendation and serious consideration upon the part of every clinical serologist goes without saying. The verbal reports one hears are to the effect that the technic is highly satisfactory.

More recently the test has been compared with nine other methods in the examination of selected serums from syphilitic and non-syphilitic persons. Six of these methods are based upon the use of unheated or raw serums. As is well known, these raw serum tests are usually more sensitive than tests employing heated serums but are subject to certain disadvantages according to the technic employed, which have been previously studied and discussed. One of the purposes of Kolmer's new test was to build up a method possessing the very high degree of sensitiveness of raw serum tests without the disadvantages.

In this series the serums of twenty-seven individuals were studied, twenty-five of these were cases of syphilis receiving chemo-therapeutic treatment. It was found that the raw serum method gave 84 to 88 per cent. positive reactions and the new test 92 per cent. with 0.1 c.c. amounts of serum. The heated serum tests, with the exception of the army method, gave a few more negative reactions. It is concluded "that the new complement-fixation test for syphilis has proved equal or superior to raw serum tests in sensitiveness for the detection of syphilis antibody in the sera of syphilitic individuals under treatment and in clinically obscure cases of untreated syphilis." The new test yielded no false positive reactions and was found to be considerably more delicate than other heated serum tests.

THE SACHS-GEORGI PRECIPITIN TEST FOR THE
DIAGNOSIS OF SYPHILIS

Among the several precipitin tests suggested as substitutes for the Wassermann reaction, the Sachs-Georgi has seemed to deserve most attention. Numerous reports of comparative tests have appeared during the year, some of them tending to a favorable conclusion while others report differences between the results obtained with this test and those given by the standard technic so wide as to rule out all thought of substituting this test for the complement-fixation technic. Such at least is the general conclusion arrived at as a result of very careful comparative tests made by Craig and Williams at the Army Medical School. The technic employed by them was that recommended by Sachs and Georgi. The antigen employed was a 20 per cent. alcoholic extract fortified by the addition of cholesterin. The cholesterinized extract before use was diluted with five parts of physiologic sodium chloride solution, inactivated serum being used for the test. In the Wassermann tests the Craig technic was employed. The person who read and recorded the results had absolutely no foreknowledge of the identity of the serums or the results obtained with the other technic.

The Sachs-Georgi test depends upon the observation that when a suitable amount of cholesterinized alcoholic extract of a human or beef heart is added to the diluted blood serum of a patient suffering with syphilis a characteristic flocculation occurs in the mixture either immediately or after incubation. The studies reported by Craig and Williams concern two groups of tests. In Group I the antigen was diluted with five parts of physiologic sodium chloride solution and the mixture used within 15 minutes after the salt solution had been added. In this group of 748 serums 11.7 per cent. gave positive reactions with the Wassermann test and 7 per cent. with the Sachs-Georgi.

"While the work on the tests in Group I was being conducted, it was noted that the antigenic extract to which the physiologic sodium chloride solution had been added two hours before use gave a much higher percentage of positive results with the Sachs-Georgi test than the same antigenic extract to which the saline solution had been added from 10 to 15 minutes before use. This phenomenon was

investigated by adding the saline solution to the antigenic extract and waiting for varying periods of time before using the mixture in the test, and it was found that the maximum of positive results was obtained when an interval of two hours was allowed to elapse after the addition of the salt solution before using the mixture as an antigen."

In Group II, the 1000 serums tested gave the following results: Positive Wassermann reactions, 156 or 15.6 per cent.; total positive Sachs-Georgi reactions, 18.1 per cent.; in addition to the positive Wassermann reactions 53 gave some fixation or 5.3 per cent. of the total number. If these are added to those completely positive the percentage is increased to 20.9.

It is in analyzing these figures upon the basis of agreements and disagreements that the discrepancies are found. These are given briefly in the summary and conclusions as follows:

(1) The results of parallel Sachs-Georgi and Wassermann reactions on 1748 specimens of blood serum from as many individuals gave a total agreement in results of 85.5 per cent.

(2) The disagreements, however, were most serious, no less than 33.3 per cent. of the positive Wassermann reactions being missed by the Sachs-Georgi test in known infections with syphilis, while 26.5 per cent. of the positive Sachs-Georgi reactions were not confirmed by the Wassermann test nor by clinical findings.

(3) These disagreements in tests performed under ideal conditions for comparison, by two separate investigators, were so radical in character and so important from a diagnostic standpoint, that we do not believe that the Sachs-Georgi reaction *alone* should be relied on as a diagnostic method for syphilis under any conditions.

(4) The difficulty of reading slight Sachs-Georgi reactions and differentiating them from precipitation due to other causes in the serum tested is so great, in many instances, that no reliable conclusion can be reached, thus leaving the test open to so much individual interpretation that it destroys the scientific value of the results. The widely divergent results with the test reported in the literature are conclusive proof of this statement.

(5) The Sachs-Georgi test, using the technic recommended by the originators, or slight modifications of this technic, is an interesting reaction from a theoretical and speculative standpoint; but it is

greatly inferior, in its practical application to the diagnosis of syphilis, to the Wassermann test or any of its accepted modifications.

(6) The Sachs-Georgi test should never be used to the exclusion of the Wassermann test in the diagnosis of syphilis, and a positive result with the Sachs-Georgi test should always be checked up by a Wassermann test.²

THE KAHN PRECIPITIN TEST

A precipitin test which gives promise of being found to have real value, that is, to give tests checking very closely with results obtained by the Wassermann reaction, is that devised by Reuben L. Kahn,³ of the Laboratories of the Michigan State Board of Health.

The antigen used in this test is made from dried and finely ground beef heart muscle tissue. This is repeatedly extracted with ether, the ether being discarded and that remaining upon the muscle tissue completely evaporated. The dried material is then extracted in alcohol for several days, at ice-box and at room temperature. To one part of the unfiltered alcoholic extract is added 0.4 per cent. of cholesterin. The other part remains uncholesterinized. For use the antigens are diluted with saline solution, cholesterinized in the proportion of 1 c.c. to 3 c.c. of saline solution; the non-cholesterinized 1 c.c. to 2 c.c. of salt solution. In making the test 0.3 c.c. of clear inactivated serum is placed in two small test-tubes; to one 0.05 c.c. diluted cholesterinized antigen is added; to the other the same amount of diluted non-cholesterinized antigen.

Spontaneous precipitation sometimes occurs immediately or within half an hour. The tests are read after incubating over night at 37.5° C. In recording the results, one or more large clumps are noted as ++++ reaction. With flocculent or granular precipitates the readings are +++, ++, or +, according to the relative size of the floccules or granules. All tests are controlled with three positive and three negative serums.

This test has now been used in parallel series with the Wassermann test in several different laboratories by persons using their own Wassermann technic, and the results are so similar there seems no

¹ "Relative Value of Sachs-Georgi and Wassermann Reactions in Diagnosis of Syphilis," Craig and Williams, *J. A. M. A.*, 1922, 79, 1597-1601.

² "The Kahn Test for Syphilis in the Public Health Laboratory," C. C. Young, *Am. J. Pub. Health*, 1923, 13, 96-99.

doubt that the Kahn precipitin test deserves serious consideration on the part of serologists.

THE ETIOLOGY OF INFLUENZA

Work is being continued with unabated interest in the effort to identify the primary or exciting cause of influenza. Observations started during the epidemic of 1918 have, for the time being at least, completely eliminated the influenza bacillus of Pfeiffer. While it is true that Cecil and Blake were able with regularity to produce pneumonia of the influenzal type in monkeys through the instillation of infinitesimal amounts of broth culture into the nares of the monkeys, no such result followed similar inoculation of human volunteers. For that matter, however, it will be remembered that experiments made in many places in an attempt to transmit influenza experimentally from patient to healthy volunteers, using nasal washings and sputum, were no more successful.

The chief points against the influenza bacillus are, however, that some bacteriologists have been unable to find it in every case of influenza. From persons suffering with measles and with many other conditions and a certain proportion of healthy persons it is possible to isolate organisms identical, so far as present methods will permit identification, with those isolated from the mucous membranes of persons suffering with influenza; it has not been possible to find an epidemic strain of the influenza bacillus; in other words, by serological tests these organisms are not susceptible of grouping as are pneumococci and meningococci, for instance, but each strain is likely to be different from every other strain. This is an important point. If a small outbreak started from a single patient and the influenza bacillus were the cause, the organisms isolated from all persons attacked should be serologically the same. Such, however, has been found not to be the case. That the influenza bacillus has important pathogenic potencies scarcely anyone denies, and that it plays an important rôle in influenza seems readily demonstrable. A few workers feel that we are not yet in a position to discard the influenza bacillus altogether on any of the grounds mentioned above; that while bacteria of the same type are ubiquitous, it is possible that we are in the same stage with regard to the influenza bacillus as we were in the pre-typing days with the pneumococcus.

The sole report which seems entirely satisfactory concerning the experimental transmission of influenza is that of Yamanouchi, who was able to infect eighteen persons, influenza developing after an incubation period of two to three days. Six other persons recently recovered from the disease exhibited no symptoms. They obtained positive results likewise with a filtrate of blood from influenza patients. The preceding were all infected by the nasal route. Other persons injected subcutaneously with filtrates of sputum and blood of patients likewise developed influenza, except one, a recent convalescent.

The success of Foster in 1917 in transmitting a type of common cold to susceptible persons by the use of filtrates has drawn attention ever since to the possibility that influenza is likewise due to a filter passer.

During the past two years Olitsky and Gates have been studying a filter-passing organism obtained from the nasal washings of an influenza patient. This was grown first in the Noguchi medium but methods were finally developed for cultivating it upon solid media. This is accomplished through the use of blood-agar plates placed in an atmosphere of hydrogen. By means of the solid cultures it was possible to extend the work far more conveniently to the study of immunological reactions and the vaccinating power of vaccines made out of the *Bacterium pneumosintes*. In animal experimentation it has been found that rabbits may be regularly immunized and that the microorganism acts antigenically just as does any other pathogenic microorganism.

From the epidemic of influenza in New York City in the early months of 1922 four new strains of *Bacterium pneumosintes* were isolated which were pathogenic for rabbits. In the blood of the injected rabbits agglutinins were demonstrated and the animals injected were resistant to infection with doses which typically affected control rabbits.

During an outbreak of influenza among the nurses at St. Bartholomew's Hospital in London, Gordon was able to obtain the characteristic "cloudiness" in Noguchi tubes in every case.

The present epidemic will give further opportunity to a larger number of workers in this field, and the results will be awaited with

interest. At the present time there is about as much reason to believe the *Bacterium pneumonsintes* is the primary cause of influenza as there was for the influenza bacillus prior to the epidemic of 1918-20.

For human experimental inoculation with cultures of filter-passing organisms there will always be volunteers in plenty, and if with freshly isolated strains carefully controlled experimental inoculations result successfully we shall begin to feel the long-sought goal has been reached.

CARBON TETRACHLORIDE IN THE TREATMENT OF HOOKWORM DISEASE

Of the interesting articles on this subject which have thus far appeared, three may be mentioned. First, the one by Maurice C. Hall, of the U. S. Department of Agriculture, which was published November 19, 1921, in the *Journal of the American Medical Association*. This article reports the use of carbon tetrachloride in the treatment of hookworm disease in animals, and the fact that he himself had taken 3 c.c. of the chemically pure material into his stomach without disagreeable result. He recommended its use in human medicine for this purpose. Second paper is by L. Nicholls, Director of the Bacteriological and Pasteur Institutes of Ceylon, and G. C. Hampton, State Director of the International Health Board, Rockefeller Foundation, who on July 1, 1922, published in the *British Medical Journal* their experiences in Ceylon. They first tried the drug on fourteen persons in doses of from three to ten cubic centimetres. A convicted murderer having consented to take the tetrachloride, he was given six cubic centimetres, and a second dose thirteen days later. One week later he was executed, and though all of his organs were carefully examined, no effect whatsoever of the two doses could be found. They then tried it on two groups of students (twenty in one and sixty-four in the other) affected with hookworm disease, obtaining 90 per cent. cures in one group and 88 in the other, and this with no untoward effect in any case. The dose recommended is ten minims for a child one year old increasing, with the addition of two minims for each year of age. This will give a fifteen-year-old youth a dose of two and eight-tenths of a cubic centimetre, the adult dose being from three to five cubic centimetres in accordance with the size of the individual. The third article, published in the *Journal of the American Medical Association* for

December 16, 1922, is by S. M. Lambert, Medical Officer of the Bureau of Ankylostomiasis of the Colony of Fiji, Suva, Fiji. He found the carbon tetrachloride very efficient in the treatment of hookworm disease, much less dangerous, and far more pleasant to take than former drugs used for this purpose. The paper reports the effects and results in twenty thousand cases. Among the conclusions are: (1) Carbon tetrachloride is a vermifuge and a vermicide of great potency. (2) That it gives little discomfort to the patient. (3) That it permits rapidly treating, at low cost, vast populations suffering with hookworm.

ARSENIC POISONING OF AIRPLANE PILOTS AND MECHANICS
IN BOLL WEEVIL ERADICATION WORK

During the past few years the boll weevil has been the cause of enormous financial loss to cotton growers in various agriculture districts of the South. Recent studies with arsenical compounds have shown that arsenic will destroy this pest, and that the arsenic-bearing compounds can be satisfactorily distributed over the cotton plants by means of the airplane. Two planes of the JN6HB type were prepared for their specialized work by the addition to the rear cockpit of a large hopper in which the arsenic compound was carried. When in operation the pilot flew low over the cotton fields while a mechanic in the rear cockpit released the arsenic through the bottom of the hopper by means of a shutter slide in such a manner that it was distributed over the cotton plants by the air currents from the propeller. The results from an agricultural viewpoint were excellent, but difficulties were encountered in preventing the poisoning by arsenic of the pilot and mechanic who were operating the machine. Both of these men were, during the flight, in an atmosphere containing large quantities of arsenical dust which was carried through their flying suits and goggles on to the surface of the body, and into their eyes. Under the circumstances surrounding these experiments, bathing immediately after the termination of a flight was impracticable. Consequently, symptoms of moderately severe arsenical poisoning were frequently observed in the men who operated the planes. Externally, the toxic effect of the arsenic was manifested by inflammation of the skin, principally of the groin, scrotum, axilla and buttock, ranging from irritation to a mild form of sloughing with

ulceration. Evidences of systemic poisoning were not so pronounced, usually consisting only of nausea, loss of appetite, and headaches. The sifting of the arsenic through the goggles into the eyes tended to produce lacrymation, burning and itching, but no permanent effects were noted beyond a slight discoloration of the conjunctiva. All of the men complained of dryness and irritation of the mucous membranes of the mouth and nose. All efforts towards protection by gauze masks or handkerchiefs were unsuccessful as these interfered with flying duties. Efforts are being made to devise methods of eliminating the danger of arsenical poisoning, and it has been suggested that a mask be made which will fit the face so as to prevent the passage of the arsenical dust and yet be comfortable while flying. Bathing facilities should also be provided to insure the immediate removal of the dust after the completion of a flight and the personnel instructed regarding the necessity of this preventive measure. Finally, it has been suggested that the hopper containing the arsenic compounds be made air-tight and the shutter valve placed beneath the plane so that the dust cannot be returned to the cockpit.—*Army Medical Bulletin*, 1922.

THE TRYPANOSOMICIDE, BAYER 205

Low and Manson-Bahr (*Lancet*, December 16, 1922) have treated nine cases of human trypanosomiasis with the Bayer remedy "205," which is said to contain no inorganic matter and to be allied to trypan red, already used for this purpose. As only three cases have heretofore been published in which this drug has been used—it is said to be valueless in the treatment of syphilis—it may be well to report their conclusions somewhat in detail:

"We have had in the period under review eight cases of *T. gambiense* infection, and one case of *T. rhodesiense* infection. All these have during the past year been treated with Bayer '205'; of these the drug failed to cure one, for he died of cerebral trypanosomiasis. Seven are now in good health and are apparently cured, while in the eighth, the Rhodesian case, though greatly improved after massive injections of the drug, the result may be said to be inconclusive.

"We are of the opinion that our experience has been particularly valuable for the following reasons: (a) We have had our patients

under continuous observation, such as is only possible in hospital in this country; and (b) our patients, being all Europeans, could easily be controlled, and the effects of the drug, both objective and subjective, could be accurately gauged; this is of special importance, for, especially in two of our cases, we were able to observe the patients regain the finer coördinated movements and psychical characteristics which cannot be appreciated in anything like the same degree in natives.

“We may venture, too, to put forward some suggestions with reference to the administration of the drug: (1) The injection is best made intravenously in the dose of 1 g. at a time, but it may also be given with safety by the subcutaneous route; it has been suggested, too, that in cases of cerebral involvement it may be injected intrathecally. (2) The individual dose should be 1 g. at a time in a 10 per cent. solution, but we have also given it with apparent safety in 2 g. doses in a 20 per cent. solution. (3) In order to kill off all the trypanosomes more than one or two injections of the drug are necessary; these should be given at stated intervals—once a week; sometimes it appears that ten are sufficient, but this cannot be taken as an invariable rule; much seems to depend upon the severity of the infection and, it may be, upon the location of the trypanosomes in the body. At any rate, the rôle of this drug in the treatment of sleeping sickness may be analogous to that of salvarsan in syphilis, in which disease it is now well recognized that it is quite impossible to forecast how many injections are necessary to eradicate a given infection; more especially is this the case when the spirochæte has invaded the central nervous system. It will be readily understood, therefore, that ‘205’ may fail to act in the same manner when the trypanosomes have invaded the brain substance. (4) It is probably more scientific to attempt a ‘*therapia magna sterilisans*’ by giving the first three injections on three consecutive days. (5) Further experience is required with reference to the cumulative action of this drug in man; its selective action upon the specialized renal epithelium requires explanation.

“As regards the course of the disease in man, we consider the following points are brought out and worthy of record: The terminal

cerebral symptoms of human trypanosomiasis are probably caused by the actual presence of trypanosomes in the brain substance; this is quite sufficient to account for the epileptiform seizures, the ataxia, and the psychical disturbances which characterize the terminal stages of this terrible disease. Under these circumstances, the trypanosomes themselves may be absent entirely from the peripheral blood, and even the inoculation of a considerable quantity into animals may prove negative; conversely, the absence of these organisms from the blood after microscopic blood examinations, even in cases where a considerable amount of blood is taken, and even when continuous blood examinations are conducted over a very long period, does not necessarily indicate that the patient is cured of his infection. It still remains to be seen whether the drug is capable of affecting the parasite when once it is locked up in the brain; at present our experience would rather indicate that this is not so.

"We can now say of Bayer '205' that, though not infallible, it is by far the most powerful trypanosomicidal substance hitherto employed; its appearance marks a definite advance, for, though the results obtained with drugs in animal experiments are not always applicable to the disease in man, yet in this instance the drug acts in an almost equally potent manner in the human subject. The ideal aimed at—a *therapia magna sterilisans*, resulting from one massive injection, and which Haendel and Joetten and others obtained by treating rats with Bayer '205'—has not so far resulted in man, at any rate not in the cases under our care."

SALVARSAN IN THE TREATMENT OF SYPHILIS

The Medical Research Council of England appointed a special committee, of which Sir Humphry D. Rolleston, whose interesting paper on gall-bladder disease in the last issue of the *INTERNATIONAL CLINICS* will be recalled, was Chairman, to study the toxic effects following the employment of arsenobenzol preparations, especially in the treatment of syphilis. Those interested in this subject should read the report in its entirety, but here it must suffice to briefly outline their conclusions:

(1) No one special arsenobenzol preparation can be regarded as more likely than others to produce ill-effects.

(2) Every large series of cases will show a certain percentage of untoward results. Errors in technic account for but a few serious accidents, and these fatalities have occurred even under the most careful control in large and completely equipped hospitals.

(3) The most important ill-effects which may end fatally are: (a) Encephalitis hemorrhagica; (b) acute yellow atrophy of the liver; (c) exfoliative dermatitis and its complications. Vasomotor phenomena, while often alarming, rarely, if ever, prove fatal. Many of these effects may without hesitation be ascribed to the arsenic in these preparations.

(4) There is a consensus of opinion amongst those concerned with the treatment of venereal disease that the arsenobenzol preparations are more efficacious than any other drug yet available for the cure of syphilis, and it is undoubted that absolute cures may be obtained by this treatment, especially in the early stages of the disease.

(5) The risks from the administration of arsenobenzol are much less to the patient with syphilis than the risks from the disease itself if treated by other methods when arsenobenzol is not employed.

RECENT ADVANCES IN SURGERY

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THE wealth of the contributions to the science of surgery during the latter part of the nineteenth century has placed surgical practice on a firm foundation and marked an unprecedented era in its progress. During the early part of the twentieth century the advance has been less rapid, but it has been made consistently, and with greater certainty. Recent notable factors that have aided in the refinement of surgical technic are standardization of hospitals, greater accuracy of diagnosis, more ready understanding of the merits of operative procedures and coöperation with them, the more efficient pre-operative and post-operative management of patients, and most important, the contributions to our knowledge concerning the cause of certain diseases amenable to surgical procedures. The surgery of 1923 illustrates the trend of advance in recent years.

The results attained in the surgical treatment of goitre are illustrative of what may be accomplished by the close coöperation of the experienced clinician, laboratory technician, and surgeon. In exophthalmic goitre the selection of the most favorable time for operation, the management of the patient before and after operation, and the skill with which the chosen operative procedure is carried out are of first importance. By such coöperation, most gratifying results will follow operation on exophthalmic goitre. Pemberton reports from the Mayo Clinic that during 1922, 1094 operations were performed for exophthalmic goitre with eleven deaths, a mortality rate of only 1.005 per cent.; while in more than 678 thyroidectomies for non-toxic goitres, including substernal and intrathoracic, there was only one death, a mortality of 0.14 per cent.

Improvement in the technic of resection of the stomach stands out prominently. C. H. Mayo's method of utilizing the greater curve of the stomach to reconstruct the pyloric end of the stomach and reestablish continuity with the duodenum after excision of benign or malignant lesions of the lesser curve is a real contribution to gastric

surgery. The application of this method and its modifications will become wider as diagnosis improves, because both ulcer and cancer are usually confined in their inception to the lesser curve of the stomach. The work of Schoemaker has led to the revival of the Billroth I, an operation which had become unpopular because of the risk of leakage from what was known as the "fatal suture angle." Recent experience with this operation has shown that a secure and safe anastomosis may be made in selected cases. Many such operations (direct anastomosis between stomach and duodenum) have been performed in the Clinic during the last year for cancers and ulcers of the pyloric end of the stomach, with very satisfactory results. The revival of the Billroth I operation is proof of the fact that the value of an operation depends upon its proper application and performance.

Partial gastrectomy for gastric ulcer, and pylorectomy for duodenal ulcer are being strongly advocated by British and European surgeons. American surgeons have not adopted the practice as a routine. While the necessity for radical removal of gastric ulcers is recognized by all surgeons, small ulcers of the stomach can be completely excised so satisfactorily, with consistently good results and insignificant risks if the procedure is combined with gastro-enterostomy, that the added hazard of partial gastrectomy does not seem justified. The technic of excision by cautery of larger gastric ulcers has been improved by using the cautery ¹ as a knife and completely excising the lesion. The original method of perforating the centre of the crater and continuing the burning until the entire crater was destroyed is quite satisfactory for the smaller ulcers. Cautery excision and gastro-enterostomy may be carried out with a mortality of less than 2 per cent.

One of the most interesting and important contributions to the subject of peptic ulcer is the recent work of Mann in producing in animals a chronic ulcer comparable in all respects to that seen in man. The production of acute ulcer of the stomach may be easily accomplished by various methods, but little success has heretofore followed the attempt to produce chronic ulcer.

The relation of ulcer to acid has been commented on repeatedly although different views are held as to the relationship. The process of neutralization of acid is also of importance, and the persistence of an ulcer may depend not only on the acid-producing mechanism,

but also on the alkaline-producing mechanism. For example, the upper portion of the intestinal tract can be subjected to an acid medium just as effectively by damaging the alkaline mechanism as by administering acid. Acting on this fact, Mann, after a series of experiments, devised a method of isolating the duodenum and transmitting its contents to the terminal ileum. The procedure consisted of (1) section of the pylorus with inversion and closure of the distal end, (2) section of the first portion of the jejunum, (3) end-to-end anastomosis of the distal end of the jejunum to the stomach, and (4) end-to-end anastomosis of the proximal end of the jejunum to the ileum at a variable distance from the cæcum. More than 90 per cent. of the animals operated on in this manner developed ulcers in the intestine, a few millimetres distal to the pyloric mucosa; the ulcer rarely touched the suture line. Most of the ulcers were relatively large, measuring from 4 to 15 mm. in diameter; as a rule, only one ulcer was present. The ulcer was remarkably like those seen in man, being more or less circular, punched out, and with overhanging edges. The base was hard and on section was thick and oedematous. In several dogs the ulcer was of the perforating type; in one, fatal hæmorrhage occurred.

Finsterer has published during the past year a number of reports of his results in the treatment of bleeding ulcers. He advocates prompt operation if hæmorrhage occurs, and says that following radical removal (usually partial gastrectomy or duodenectomy) the mortality rate during the first twenty-four hours after the hæmorrhage is only 5 per cent., whereas the mortality rate after this period is 30 per cent. This practice is quite contrary to that favored in this country, since most American surgeons believe that the patient has a better chance for recovery if operation is delayed until the period of shock which follows the hæmorrhage has passed, and his condition has become more satisfactory. Finsterer has, however, revived the discussion of the perplexing subject, hematemesis, and has drawn attention to a method of management which deserves consideration.

The recognition of the value of rest in the healing of wounds marks an important advance in the post-operative management of patients with gastro-intestinal disorders. The results of extensive operations on the stomach, duodenum, and small or large intestines are unquestionably better if nothing is given by mouth for a number

of days after operation. The value of such treatment is particularly apparent in extensive resections for gastric cancer. The time during which all fluids and nourishment by mouth should be withheld will vary from three days following simple gastro-enterostomies to six or seven days following extensive plastic operations. Meanwhile the body fluids are maintained by proctoclysis and hypodermoclysis. Not only is the mortality rate in the extensive operations thereby lowered, but the convalescence is smoother in every respect.

Operations on jaundiced patients have always been associated with high risk, because of the danger of uncontrollable post-operative oozing. Walters, of the Mayo Clinic, following the suggestion of Lee and Vincent, has, during the past year, demonstrated that by injection of calcium chloride solution (5 c.c. of a 10 per cent. solution over a three-day period), the coagulation time of the blood is lowered so that operation can be carried out with much less risk; in fact, the operative mortality following such treatment has been markedly reduced.

One of the most interesting contributions to surgery of the blood-vessels has been the operation of Le Riche and its modification by Handley. Le Riche attempted to obtain a vasomotor dilatation by sectioning the sympathetic nerves which lie in the outer coat of the vessels. He accomplished this by removing a portion of the outer coat of the main artery supplying the affected limb. His observations led him to believe that such a procedure produced a contraction of the artery at the site of operation with a temporary vasomotor constriction below, and that the pulsations in the artery below the site of operation temporarily ceased. After about fifteen hours, however, this contraction gave way to a vasomotor dilatation. The operation has been used in cases of chronic ulcer resulting from nerve injuries, of painful stumps following amputation, of Raynaud's disease, of contractions following injuries, and several other conditions with excellent results.

About six months ago, Handley reported two cases of senile gangrene treated along the lines suggested by Le Riche. Instead, however, of attempting to remove a portion of the outer coat of the artery, Handley paralyzed the sympathetics by injecting 95 per cent. alcohol into the outer wall of the artery. He found that this procedure gave an immediate vasomotor dilatation and that great improvement was

obtained in both cases. This improvement was still present at the end of nine weeks, while Le Riche claimed that the vasomotor dilatation which followed his operation lasted for only three or four weeks.

Sistrunk has used Handley's operation in a number of cases of Buerger's disease with excellent results. In two of these, pain in the affected limbs ceased immediately after operation, and in one in which an intractable ulcer was present, the ulcer was entirely healed a few days after operation.

In thoracic surgery, Hedblom, in cases of cancer of the thoracic œsophagus, has succeeded in performing an exploratory posterior mediastinotomy under local anæsthesia without producing pneumothorax. The approach is made from the right side, so that the arch of the azygos vein may serve as a definite landmark to the œsophagus, which is a distinct aid to the surgeon, as it has been a fairly common experience that the œsophagus has been rather difficult to identify at operation. Furthermore, the approach from the right side obviates the necessity of working around the descending aorta, and also lays bare the œsophagus at the region which, from the left approach, lies behind the arch of the aorta. Under careful regional anæsthesia, there is comparatively little pain incident to resection. Hedblom believes that, in early cases showing no extensive infiltration of the tissue surrounding the outer walls of the œsophagus, this approach makes possible resections that promise to result in permanent cures.

For cancer situated at the cardia, or for growths involving the cardiac portion of the stomach, but situated so high that anastomosis between the abdominal œsophagus and the resected stomach is impossible, a combined abdominal and thoracic approach has been used following preliminary rib resection, and in one case resection of the lower œsophagus and the lower end of the stomach was successfully performed, the patient recovering completely from the operation. In this case the cut end of the œsophagus was attached to the lateral thoracic wall as a permanent stoma.

For unilateral bronchiectasis, a graded extrapleural thoracoplasty has been performed under local anæsthesia, followed by alcohol injection into the nerve-trunks at the time of the posterior resection, securing thereby prolonged anæsthesia and so avoiding the voluntary inhibition of cough following operation. The bronchial secretion in

such cases must be coughed up, otherwise acute pulmonary suppuration is likely to intervene, owing to the retention of the secretions. In a considerable number of typical cases of bronchiectasis without evidence of associated abscess, this operation has been performed without mortality. There was an improvement in all cases; in some, the improvement was so marked as to approximate cure.

The experimental production of nephrolithiasis was successfully accomplished in 1922 by Bumpus and Meisser. Eighty-five per cent. of dogs experimentally infected with the streptococcus from the urine of a patient with nephrolithiasis developed calculi. The method of inoculation consisted in removing the pulps of the teeth of dogs under strict aseptic technic, and introducing the streptococci in dense suspension into the pulp chambers with fine capillary glass pipettes, after which the canals were sealed with impervious dental cement. The resulting stones varied from small concretions to stones from 3 to 7 mm. The stones were hard, angular, and rough, and were chemically similar to those in nephrolithiasis in man.

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ABSTRACTS FROM SURGICAL LITERATURE OF 1922

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ANÆSTHESIA

During the year 1922 anæsthesia has received as much attention as has operative technic itself. The literature emphasizes the indications and advantages of local and regional anæsthetics. Interest in the use of novocain (or procain) has naturally been renewed with possibility of obtaining the drug—an impossible accomplishment during the World War. The inherent advantages of novocain are so apparent as hardly to need enumeration—the comparative safety of the drug in prescribed doses, and the possibility of magnifying the analgesia by the addition of adrenalin chloride (suprarenin), so that a large area may be anæsthetized with a safe dose of the procain.

Wiedhopf (*Deutsche Zeit. f. Chir.*, 1921, clx, vii, 392), however, has collected a list of fourteen fatalities due to the procain, two deaths at goitre operations under paravertebral and twelve under high sacral anæsthesia. The extreme vascularization of the extradural space provides a huge surface for absorption of the injected fluid. The high pressure required to force the anæsthetic into the sacral canal might force it mechanically into the circulation. In many of the toxic cases reported, it is mentioned that blood had dripped from the needle, showing that a vessel had been pierced. This seems to have occurred oftener with the sacral, paravertebral, splanchnic and trigeminal technics than with others. Absorption of the drug is more liable in loose and highly vascularized tissue.

Transient toxic phenomena seem much more common since the war; the custom of giving a narcotic may be responsible for a cumulative toxic action.

Wiedhopf's experimental research has confirmed the fact that the addition of sodium bicarbonate enhances the action of the procain so that a smaller dose may be used.

The interest in *regional anæsthesia* has been stimulated by Labat's work at the Mayo Clinic. Labat (*Johns Hopkins Hosp. Bull.*, 1922, xxxiii, 139) states that most of the post-operative complications in surgery of the rectum and rectosigmoid may be attributed to inhalation narcosis, especially ether, and can be avoided or considerably lessened by the use of regional anæsthesia. This latter does not increase the resistance of the patient, but leaves the vital functions of the body in the same condition. The anæsthesia does not prevent pulmonary embolism, but excludes the danger of pulmonary post-operative complications, provided no acute condition exists at the time of the operation. The anæsthesia has no ill effects on the gastrointestinal tract, with possibility of paralytic ileus and tendency towards hæmorrhage. Previous conditions, such as chronic lesions of the heart, high blood-pressure, pulmonary tuberculosis, easily controlled diabetes, and chronic renal conditions do not seem to interfere with operative prognosis. The use of morphine and scopolamine controls the psychic state of the patient, but the stage of twilight sleep must not be reached. With the abdominal field block procedure, colostomy is performed painlessly, provided the patient is not too obese and the mesocolon is not too short; the sacral block, consisting of the caudal or epidural and trans-sacral block, added to the paravertebral block of the last three lumbar nerves on both sides, constitutes the method of choice for the posterior resection of the carcinomatous rectum and rectosigmoid. The administration of the anæsthetic is not difficult, but it requires practice and patience, irrespective of the gentleness which must always be used in handling conscious patients.

Labat and Meeker (*Surg., Gyn., and Obstet.*, 1922, xxxiv, 398) further observe that regional anæsthesia with novocain adrenalin solution is the method of choice in inguinal herniotomy and should be used generally instead of only for patients who are unsafe subjects for general anæsthesia. For inguino-scrotal or bilateral herniotomy in very obese patients, spinal novocainization is easier, quicker and as safe as regional field block.

Gwathmey and Greenough (*Am. J. Surg.*, Jan., 1922, xxxvi, 22), writing on the advantages of synergistic anæsthesia, state that magnesium sulphate may be combined with nitrous oxide or ether for anæsthesia to the advantage of both. The synergistic action of

the magnesium sulphate decreases by about one-half the amount of nitrous oxide or ether necessary for anæsthesia. Morphine, magnesium sulphate and nitrous oxide-oxygen give more relaxation than morphine and nitrous oxide-oxygen, frequently as much as with ether anæsthesia. With their technic a very satisfactory anæsthesia may be given with reduction or elimination of post-operative nausea, vomiting, pain, distension, pneumonia, and shock.

Boyle (*Am. J. Surg.*, 1922, xxxvi, 17) now uses gas-oxygen-ethanessal-chloroform combined anæsthesia for nose and throat surgery as well as for abdominal work. The technic consists in preliminary morphine, atrophine, and scopolamine; then gas and oxygen are given in proportion of about one of oxygen to ten of gas, and as soon as the breathing gets deep and regular, the gases are allowed to pass over the surface of a mixture of chloroform and ethanessal (equal parts) so that they pick up a small amount of the mixture. In a few minutes the breathing becomes automatic with slight soft stertor. The tap on the mixture bottle is then turned back so that the patient is having only gas and oxygen, and the operation is started. The amounts of gas and oxygen must be regulated according to the case—it is usually about one of oxygen to four parts of nitrous oxide. Very small amounts of ethanessal are adequate by this method—for a long operation, such as a removal of a breast, a drachm or a drachm and a half are usually sufficient. To give the nitrous-oxide-ethanessal-chloroform combination successfully and well, the anæsthetist must remember that the patient's color must always be pink, and that the mixture must not be given for a longer period than is absolutely necessary.

As compared with the comparative safety of local anæsthesia with the synthetic preparations now in use, *spinal anæsthesia* even in the hands of experts has shown a mortality which seemingly indicates that this method has a very limited field of application.

As regards *colonic anæsthesia* as advocated by Gwathmey, there seems to be some variance of opinion as to its results. McWilliams (*Annals of Surgery*, Jan., 1923, lxxvii, 116) reports operations successfully performed under it, and states that it is the method of anæsthesia regularly employed at the Skin and Cancer Hospital for all head and neck operations. "It is a great advance over all

methods of inhalation anæsthesia, and we have yet to see an untoward effect from it, and our series of cases using it is large."

Dr. Carl Eggers (*Annals of Surgery*, Jan., 1923, lxxvii, 117) remarks "that while it seems unscientific to inject a fixed amount of ether, the rate of absorption of which one is unable to control," nevertheless, in practice, it works out very satisfactorily, since by mixing the ether (four ounces) with oil it is absorbed but slowly and one can usually recover part of the mixture if necessary. Patients with a patent ileo-cæcal valve are not suited to this form of anæsthesia, because in them the ether-oil mixture may pass into a part of the intestines from which it cannot be recovered. Dr. R. T. Morris (*ibid.*) remarks "that a notable degree of relaxation of the abdominal muscles belongs to colonic anæsthetization." The method has peculiar advantages in cases of bronchiectasis, bronchitis and pulmonary tuberculosis.

Dickinson (*Am. J. Surg.*, 922, xxxvi, 40) thinks that ether-oil colonic anæsthesia in the handling of toxic goitre offers an admirable way of stealing the thyroid, but complains that as yet it has not proven a safe procedure.

POST-ANÆSTHETIC LUNG ABSCESS

While the increased frequency of lung abscess has been ascribed to the prevailing methods of tonsillectomy, the more recent literature seems to indicate that post-operative lung abscess is not always a sequence of tonsillectomy but may follow anæsthetization in almost any surgical procedure. Whether aspiration is responsible for the complication or whether it is purely an embolic process is still a moot question.

Moore (*J. A. M. A.*, April 29, 1922, lxxviii, 1279) in an analysis of over two hundred cases of pulmonary abscess following operative work about the upper respiratory passages, concludes that the vast majority of cases are of respiratory origin because of (a) time of development, and (b) involvement of the lower lobes of the lung in 60 per cent. of the cases, being almost the same relative incidence as in cases of inspired foreign bodies. He states that pulmonary abscess occurs once in from 2500 to 3000 tonsillectomies. Blood-stream transmission of infected material, causing pulmonary abscess, occurs but in a relatively small number of cases. Lymphatic

extension is a rare mode of infection. Moore emphasizes the importance of posture—the semi-recumbent and upright positions are not as free from this complication as has heretofore been supposed. Operation should be performed with the patient in the supine position, with the head slightly lowered. No opiates should be given before the operation. There should be no profound anæsthesia on account of the effect on the pharyngeal reflexes during and immediately after operation; attention should be paid to Jackson's oft-repeated admonition not to drug the bechic reflex unnecessarily.

Gwathmey (*N. Y. State J. Med.*, 1922, xxii, 394) considers that the avoidance of pulmonary abscess with general anæsthesia in nose and throat surgery is best fostered by the following procedure: An adult patient should be given such preliminary medication as will relieve his mind of worry, and he should be carried to the operating room. The anæsthesia should be so administered that full relaxation remains during the operation, but the patient should have full control of all reflexes when returned to bed. Posture on the table should be such that control of blood is easy. There should be free respiration at all times, which includes tongue retraction rather than tongue depression. A proper suction apparatus should be in the hands of the anæsthetist or nurse rather than the assistant surgeon. Oil-ether colonic anæsthesia is absolutely safe and entirely satisfactory for all operations upon the upper air passages.

Inhalation anæsthesia should consist of nitrous oxide and oxygen with small amount of anesthol to commence the anæsthetic, and nitrous oxide, oxygen and ether or paraldehyde to continue it, and finally, with oxygen to return the patient to consciousness and an analgesic state.

A shaped block under the neck and shoulders renders easier the management of the blood in the throat than does a slight Trendelenberg position. In a tonsillectomy, the throat should never be allowed to fill with blood even for a few seconds.

THORACIC SURGERY

Matas (*Arch. Surg.*, 1922, v, 110) reviews historically the subject of thoracic surgery in a discussion of artificial aids to respiration in surgical pneumothorax, occurring during intrathoracic operations. He concludes that in view of the contradictory facts of clinical experi-

ence and the impossibility of predicting in any case what the pleuro-pulmonary reactions will be when the normal non-adherent pleura is opened and the collapse of the lung takes place, it is only right that in any contemplated intrathoracic operation in which either a unilateral or a bilateral pneumothorax may occur, precautions should be taken to forestall the accidents which may attend this condition. The difference between this attitude and that taken by the opponents of differential pressure or aided respiration is that they believe that there is risk only in bilateral pneumothorax and none whatever in unilateral. Matas takes issue with this view since it is undeniable that in a certain, but undetermined, percentage of cases the opening of one pleura may be attended by alarming or even fatal manifestations.

To protect the patient from these unknown but possible dangers, the simplified methods of plus-pressure ventilation of the lungs on the Meltzer-Auer principle are the safest for general use. Whether by the usual anæsthetic face mask, by intratracheal intubation, or, preferably, by nasopharyngeal catheterization, the simplest and safest method, the requirements of anæsthesia and pulmonary ventilation are combined in the gas-ether-oxygen sequence appliances. These deliver a steady stream of the combined or simple gases under a regulated plus-pressure sufficient to maintain the respiratory function of the lung during anæsthesia.

Lilienthal (*Annals of Surg.*, March, 1922, lxxv, 257) makes a report of thirty-one cases of resection of the lung for suppurative infections—suppurative bronchiectasis. He describes his technic at some length. He states as his conclusions that chronic pulmonary suppurations, wholly or partially of the bronchiectatic type, are rarely curable without the extirpation of the pathological focus. The surgical removal of a single pulmonary lobe for chronic pus infection has a mortality of about 42 per cent. The danger is much greater when more than one lobe is infected or in the presence of other complications. Remissions of weeks or months may occur spontaneously. Palliative operations may be followed by improvement, rarely by apparent cures. The commonest cause of the disease is infection due to the aspiration of infected material during tonsillectomy. Radical operation should not be undertaken short of several months after onset unless the disease is obviously spreading. The

proper type of operation may be determined only on full exposure by thoracotomy.

THYROID

Goetsch (*N. Y. Med. Jour.*, 1922, cxv, 327) states that the two most valuable clinical tests for the detection of hyperthyroidism are Goetsch's own epinephrin hypersensitiveness test and the basal metabolic rate determinations. The epinephrin test is based upon the fact that in experimental hyperthyroidism the sympathetic nervous system is hypersensitive to epinephrin chloride, and in states of clinical hypothyroidism or after thyroidectomy in animals, there is an increased tolerance to injections of epinephrin. Goetsch has applied this test to 500 patients suffering from thyroid disorders and has found that patients with hyperthyroidism uniformly showed a remarkable sensitiveness to small doses of subcutaneously administered epinephrin, in form of increased blood-pressure, and pulse and exacerbation of clinical signs and characteristic symptoms. Response is in proportion to the degree of hyperthyroidism; the test always confirms and usually establishes the diagnosis of hyperthyroidism. If the response be negative, one can state definitely that hyperthyroidism is not present. The epinephrin test is regarded as mildly positive when, after the injection of five-tenths c.c. of one to 1000 epinephrin chloride solution a rise of about ten points in pulse or systolic pressure or in both is obtained and certain clear-cut subjective and objective signs and symptoms characteristic of hyperthyroidism are brought out. Normal subjects do not react to this dose; reactions must be considered as mild, moderate, and marked. The typical response is characteristically sustained and occurs in two phases, a primary major reaction followed by a secondary minor reaction. In one to one-half hours after the injection the patient is again practically normal. After operation followed by subsidence of hyperthyroid symptoms there is a fairly prompt subsidence of the sympathetic hypersensitiveness to epinephrin.

In exophthalmic goitre cases the epinephrin reaction has been uniformly positive; in colloid goitre cases, without symptoms of hyperthyroidism, the reaction is negative; in adenoma cases with clinical symptoms of hyperthyroidism, reaction was positive in pro-

portion to the severity of the symptoms. In cases with degenerated adenoma without activity the reaction was nearly or entirely negative. In cases of adenoma of questionable activity operation is now being advised on the basis of a positive epinephrin test in the absence of which diagnosis often remains entirely obscure. At operation adenomata too small to see or palpate are often found, and striking benefit results on their removal.

The epinephrin test has also proved valuable in differential diagnosis from incipient tuberculous and other conditions. Tuberculosis uncomplicated with hyperthyroidism gives a negative reaction to the test as do also psychasthenic conditions, alcoholism, acromegaly, arteriosclerosis and other diseases.

Lieb, Hyman and Kessel (*J. A. M. A.*, 1922, lxxix, 1099) have made a clinical distinction between exophthalmic goitre and "autonomic imbalance," a condition characterized by the presence of sympatho-mimetic symptoms of exophthalmic goitre, but with an absence of the characteristic elevation of the basal metabolism. The predisposing causes of autonomic imbalance are still unknown, the exciting causes, physiologic and pathologic, are most frequently the sex-epochs and foci of infection in the naso-pharynx.

In attempting to discover a pathognomonic clinical test, the writer investigated the response to various drugs, especially atropine and epinephrin. Two groups of controls, numbering respectively 30 and 40 "normal" persons, were studied. Of these "normals," a few gave evidence of a mild grade of autonomic imbalance, but 33 per cent. reacted to epinephrin and 25 per cent. to atropine, a fact indicating that abnormal drug reactions can exist in the absence of autonomic imbalance. Drug tests were made on a few patients with active autonomic imbalance and on fifty cases of exophthalmic goitre. The type of reaction did not permit clinical grouping into sympatheticotonia and vagotonia, the intensity of drug reactions did not parallel the severity of the presenting symptoms. Only 6 per cent. of these patients failed to react to one or the other drug. The absence of response may be explained pharmacologically: Epinephrin stimulates the myoneural junctions of the thoracico-lumbar, and atropine paralyzes those of the bulbo-sacral division of the involuntary nervous system. These responses are not indicative of the tonicity of the involuntary nervous system.

In former animal experimentation it was found that epinephrin repeatedly injected at short intervals caused a progressively increasing vascular response which was interpreted as an artificial "sensitization." An analysis of this phenomenon was undertaken in the hope of throwing light on the mechanisms of autonomic imbalance and exophthalmic goitre. The negative effects of extirpation and injections of potent extracts of various ductless glands excluded them as participants in the sensitization (thyroid, suprarenal, parathyroid, spleen and kidney, by ablation; thyroïdin, epinephrin, pituitary extract and ovarian extract, by intravenous administration). Since every known variable was carefully controlled, the conclusion was inevitable that the phenomena of sensitization were the result of a physico-chemical change induced by epinephrin and involving the myoneural junctions of the thoracico-lumbar system. The writers disagree with the interpretation that an increased response to epinephrin signifies hypersecretion of the thyroid. They have found no evidence that thyroxin increases the epinephrin response; have produced sensitization in the absence of the thyroid, and have found sensitiveness to epinephrin in a large number of "normal" human subjects. They therefore are convinced that the epinephrin reaction (Goetsch) is independent not only of the normal but also of the hyperplastic thyroid gland. They also believe that an increased reaction to epinephrin is no indication of excessive tonus of the thoracico-lumbar (sympatheticotonia). Confirmation of this belief is found in the law that a tissue in high tonus is less reactive to a stimulus than the same tissue in a state of low tonus or atony.

Attempts to alter the epinephrin response of the *pithed cat* by injections of buffer salts, of cations, of anions, and of alkaloids were without effect. Magnesium sulphate depressed strongly and cocain augmented greatly the degree of the response.

Previous workers who have obtained similar results have invariably interpreted this "sensitization" as a specific hormone effect. The inability to obtain sensitization with thyrotoxin and other hormones, and the occurrence of sensitization after extirpation of the endocrine glands, amply demonstrate that it is not a hormone effect.

The factors regulating the tonicity of the involuntary nervous system remain unknown; there is no proof that they are secretions

of the ductless glands; the authors likewise can find no evidence to support a theory that these hormones are capable of acting as emergency stimulants of the involuntary nervous system. It seems unwise to designate the condition of exophthalmic goitre and autonomic imbalance as endocrine disorders and the writers therefore favor the abolition of such terms as "hyperthyroidism," "dysthyroidism," and "suprarenal insufficiency."

The majority of patients presenting exophthalmic goitre give a history, past or present, of autonomic imbalance. The actual transition from autonomic imbalance to exophthalmic goitre has been observed; this is characterized by an augmentation of the symptoms of autonomic imbalance plus a metabolic upset, as evidenced by an elevated basal metabolism.

The use of atropine in disturbance of the bulbosacral division of the involuntary nervous system is advocated; if the tonus is low, small doses are indicated to stimulate the centre without affecting the nerve endings; if the tonus is high, large doses paralyze the endings and nullify the excessive central action.

Seitz (*Zentralbl. für inn. Med.*, 1921, xlii, 842), taking the condition of the blood-sugar as an index for the condition of the sympathetic nervous system, made tests of blood-sugar metabolism in fifty cases of strumectomy. A few days before operation the patient was examined, fasting, for the blood-sugar value, and also an hour after test injection of 100 gms. glucose. In a portion of the cases the same test was made with 0.75 mg. of epinephrin. Usually the same tests were repeated two weeks after operation, and, in a few instances, after still longer intervals. From his findings Seitz concludes that very frequently—but by no means constantly—in affections of the thyroid gland the sympathetic nervous system is abnormally irritable. This is most pronounced in cases of exophthalmic goitre. He believes that his researches constitute a strong argument against the sympathetic neurosis theory: More especially since, in some cases of severe exophthalmic goitre, no disturbance of the sympathetic system was found. Along with other clinical symptoms, the behavior of the blood-sugar would seem a valuable aid in judging the severity of a given case. The results obtained from the patients tested prove conclusively the value of operative treatment in exophthalmic goitre.

Troell (*Svenska Läders allskapets Handl.*, 1922, xlviii, 1) tabulated the findings in sixty-two operative cases of exophthalmic goitre. In the patients with milder thyroid intoxication, the goitre was adenomatous, and these patients averaged ten years older than those of the former group. The blood-pressure was within normal range, as also the tolerance for carbohydrates in contrast to the high blood-pressure and reduction of carbohydrate tolerance in the diffuse group. This classification seems more plausible than that of vagotonic and sympatheticotonic, as the reactions to epinephrin and pilocarpine were conflicting. Both these nervous systems seem to blend in the clinical picture of exophthalmic goitre.

Labbé, Stevenin and Nepveaux (*Soc. Méd., Hop.*, Paris, 1922, xlv, 902) have confirmed the work of American experimentors in the study of basal metabolism in exophthalmic goitre. Labbé uses a war-gas mask with Tissot valve, spirometer and Laulanié's endiometer, a combination which he considers gives greater precision than the Haldane apparatus for the testing of the basal metabolism.

Curschmann (*Rif. Med.*, 1922, xxxviii, 273) states that during the years of food scarcity from the war, the number of cases of exophthalmic goitre constantly declined, and the condition in the old cases constantly improved. With the progressive improvement of food conditions the number of the cases of exophthalmic goitre has been increasing to pre-war figures, especially among the well-to-do. Inquiries of 22 physicians and surgeons throughout Germany elicited similar reports: Deneke at Hamburg had 217 cases of exophthalmic goitre between 1909 and 1914 and only 42 between 1915 and 1920; Kummel operated on 48 patients in 1912 to 1915 and on only 20 in 1916 to 1919. These and other data seem to establish that undernourishment checks the functioning of the thyroid, a fact which suggests that fasting may prove an important adjustment in the treatment of exophthalmic goitre like Allen's fasting treatment of diabetes. Not only meat, but calories in general and fat in particular, should be tentatively reduced, the metabolic findings being carefully recorded.

Loewy and Zondels (*Deutsche Med. Woch.*, 1921, xlvii, 1387) describe a series of cases which are in accord with Neisser's findings that potassium iodide in doses of a few milligrams will improve not only nutrition, but also subjective conditions in exophthalmic goitre.

Improvement was due to the reduction to normal of the pathologically increased metabolism. The decrease in the gas exchange was 19.9, 28.8, and 29.5 per cent., respectively, in three different cases. Successful treatment depends in a great measure on careful regulation of the dosage.

Ménard and Foubert (*J. Radiol.*, (Paris) 1922, vi, 162) have treated 17 patients with exophthalmic goitre by galvanization alone, 10 by radiotherapy alone, and 57 by a combination of the two methods. Certain cases refractory to one method were improved or cured by the use of the other. Galvanization is an ideally harmless treatment of positive efficacy. The similarity of the disturbances of exophthalmic goitre with those of pluriglandular and sympathetic derangement suggested extending the action of the galvanic current to the sympathetic and endocrine systems. This abdomen-thyroid-spine galvanization treatment seemed to act on all the manifestations of the disease and its subjective symptoms. In mild forms the symptoms rapidly subsided, but the writers advise continuing the sittings for three months.

Handels and Kriser (*Klin. Woch.*, 1922, i, 271) have used röntgenotherapy in 38 cases of exophthalmic goitre, with good results so far, in about 28 per cent. of their cases.

Terry (*J. A. M. A.*, 1922, lxxix, L) has treated 33 patients suffering from true exophthalmic goitre with radium emanations for the purpose of converting them into better risks for major surgical procedures. Final results have been obtained in 16 patients, of whom ten were definitely cured after resection.

GALL-BLADDER AFFECTIONS

Willis (*Surg., Gyn., and Obst.*, 1922, xxxiv, 183), in discussing the relative merits of "ideal cholecystotomy, cholecystectomy and cholecystomy," divided patients into two general classes, first, those who are acutely ill, and in whom severe pathology has existed for some time, and second, those with vague but suggestive symptoms of comparatively short duration and in whom the local changes are relatively slight.

The patients of the first group are frequently elderly, often excessively fat, and may show cardiac, renal and hepatic damage, and not infrequently obstructive jaundice. The opened abdomen shows obvious

evidence of disease of the gall-bladder. Although theoretically these are the very cases presenting indications for cholecystectomy, they are nevertheless the ones in which cholecystectomy sometimes proves disastrous, while surprisingly good results may be obtained by cholecystotomy, and the institution of drainage. It is surprising to what an extent the apparently hopelessly involved gall-bladder will recover at least a part of its functional ability following cholecystotomy. The fact that a secondary operation may be necessary is sometimes satisfactory rather than otherwise. Even though the presence of a bile-soaked drain in the peritoneal cavity excites the production of dense adhesions, patients who have suffered from severe gastric distress, from acute agonizing colic, from recurring exacerbations of an infectious process, will welcome the relative relief gained by the process and disregard the minor discomfort of additional adhesions.

In patients of the second group, those with vague symptoms of short duration, theoretically it would appear that the conservative cholecystotomy would be the method of choice. Actually, however, the results seem disappointing in the majority of these patients: The discomfort and impairment of function before operation had been slight; the institution of drainage after cholecystotomy produces characteristic dense adhesions which subsequently may produce very definitely greater discomfort and functional impairment than existed before operation. Willis has reached the conclusion that if any operative procedure is to be undertaken in this type of patient it should consist in removal of the gall-bladder and complete closure of the abdomen without drainage. By this omission adhesion formation is escaped, largely or entirely. This omission, in the absence of obvious contra-indications, seems amply justified by surgical experience.

In cases of calculi in the gall-bladder, but with no indication of infection, Willis thinks that neither cholecystectomy nor cholecystotomy with drainage is justifiable; the omission of drainage after cholecystectomy is not new; it is the "ideal cholecystotomy" practiced and abandoned many years ago, a fact that is, however, no proof of its uselessness. Formerly diagnosis in gall-bladder cases was uncertain and unreliable, so that the operation was practiced largely on the type of advanced cases here described. Even to-day, the performance of "ideal cholecystotomy" on improperly selected

cases will result in failure. Willis has practiced the "ideal" operation in a limited number of cases with gratifying results.

Richter (*Surg., Gyn. and Obst.*, 1922, xxxiv, 180) advocates closure after cholecystectomy in suitable cases; following the work of Willis, the method has been taken up and enough experience gained to justify expectation of its permanency. Closure after duct operations requires greater technical dexterity and is advocated with greater diffidence. Richter's personal experience suggests unusually favorable results. Among Richter's cases of over 100 cholecystectomies there have been two deaths, one in exploratory operation with incidental removal of a pathological gall-bladder, and one after pneumonia. Neither death has any bearing on gall-bladder surgery. Wilensky (*N. Y. St. J. Med.*, 1922, xxii, 180) states that operation in gall-bladder disease accomplishes a double object: (1) It removes a focus of infection; in cholecystectomy this is actually ablated from the body more or less completely; in cholecystotomy the focus of infection is drained until the infection disappears. (2) Operation, when bile drainage is employed, exerts a beneficial effect upon the metabolic disturbances which are associated with gall-stone formation. The good effects of bile drainage is probably in the nature of a recuperative process, and seems to have similarities to the phenomena of fatigue and rest in muscle tissue.

In operating, attention should first be directed to the common duct as this carries the greater urgency, and secondarily, to the gall-bladder if the nature of the pathology demands it and if the condition of the patient permits. In the surgery of the common bile-duct two points are essential to success: (1) That the common duct be well drained; and (2) that the abdomen be drained down to the line of suture. The possibility of closing the incision in the common duct, which has been discussed and advocated by Richter, is one which ordinarily should not be considered, since contra-indications are continually being presented which preclude the safe employment of this refinement of technic.

In regard to cholecystectomy without any form of abdominal drainage, Wilensky thinks that an intelligent use of drainage does not lengthen the time of healing nor of the convalescence, but removes such a potent source for evil as to be a highly desirable part of

the technic. In competent hands the mortality of uncomplicated gall-bladder operations is very small—not more than 2 per cent. With the association of complications, and in late and neglected cases with infection, prognosis is not so good. Mortality is highest in common duct obstruction by stone.

Fullerton (*Brit. M. J.*, 1922, i, 995), in an attempt to retain the gall-bladder to facilitate the drainage of the common bile-duct when for any reason the flow of bile from the common duct to the duodenum is partially or completely obstructed, has modified the operation of cholecystenterostomy. The usual procedure in relieving obstruction has been to anastomose the gall-bladder to the stomach, to the duodenum or even to the colon. Certain objections may be urged against these procedures: (1) The gall-bladder and its contents are infected and may remain so, constituting a grave danger to the health of the patient. (2) Gall-stones may form, or may recur. (3) The contents of the stomach, duodenum, or colon may regurgitate into the gall-bladder.

These disadvantages may be met, to a large extent, by the following procedure: The gall-bladder is opened and cleared of its contents. A light clamp is placed near the neck, and the greater part of the viscus removed. The small remaining portion is anastomosed to the duodenum, so that when the operation is completed the cystic duct opens into the duodenum without the intervention of any sac which might harbor gall-stones or regurgitated intestinal contents. Just enough of the gall-bladder is left to enable the anastomosis to be satisfactorily accomplished.

Porter (*Surg., Gyn. and Obst.*, 1922, xxxv, 110) finds that routine removal of the gall-bladder is based upon the following assumptions: (1) That the gall-bladder is an unimportant organ and that its removal is followed by no untoward results. (2) That all gall-stones have their origin in a "primary cholecystitis" and that recurrence or continuation of symptoms following cholecystostomy is usually due to the fact that the gall-bladder was not removed.

The facts are: (1) All evidence at hand supports the contention that the gall-bladder is an important organ and evidence is not at hand to warrant the conclusion that its removal leads to no serious consequences. (2) Cholecystic disease, including gall-stones, fre-

quently, if not usually, originates in the liver. Routine cholecystectomy frequently fails to cure and leads to the removal of healthy gall-bladders in over 4 per cent. of cases. The gall-bladder should not be removed unless it has become useless or dangerous by disease.

Hartman, Smyth and Wood (*Ann. Surg.*, 1922, lxxv, 203) performed experimental cholecystectomy with high ligation of the cystic duct on ten dogs; on the basis of this work they reached the following conclusions:

(1) Where a cystic-duct stump is left, it usually dilates to form a pseudo gall-bladder; hence we may get a recurrence of the symptoms after a cholecystectomy.

(2) Where the cystic duct is ligated flush with the common duct, there is general dilatation of all ducts, indicating that there is pressure in the biliary system.

(3) The gall-bladder is not essential to life, but it seems to have a very definite function of storing bile and acting as a tension bulb to regulate pressure in the biliary system.

(4) Nature endeavors to restore the normal condition in the biliary system, after the removal of the gall-bladder, by the ducts, including the cystic-duct stump, undergoing a dilatation and enlarging. It is an indication that nature rebels against man's attempt to improve her, hence the gall-bladder must have some definite function.

Two clinical cases give additional weight to these experimental conclusions. Moynihan (*Brit. Jr. Surg.*, 1922, x, 127), through study of the gall-bladder walls and of bacterial content of the bile in cases in which cholelithiasis was present or suspected, has found that there are conditions of the gall-bladder apart from calculous disease, which cause a close mimicry of the symptoms of gall-stones, and which can be successfully treated only by cholecystectomy. The condition producing the symptoms commonly diagnosed as stones in the gall-bladder is an infection of the gall-bladder, caused by stones, but not seldom existing in an early or advanced degree in the absence of stones.

There are several possible avenues which may be traversed by invading microorganisms: (a) Infection may ascend from the duodenum along the common and cystic ducts to the gall-bladder, or along the common and hepatic ducts to the liver (very rare). (b) Infection

may descend from the liver at a time when the liver is momentarily overwhelmed by large numbers of organisms; such organisms thus gain access to the gall-bladder and form the nucleus of stones. (c) Infection may be derived from the blood (Rosenow). (d) Infection may reach the gall-bladder from the liver by way of the lymphatics. (e) Infection may get to the gall-bladder by direct continuity (rare, in gastric or duodenal ulcer).

All gall-stones, other than a single cholesterin stone, are due to infection, and infection may be present before stone formation, and may give rise to symptoms, suggestive rather than decisive. These are wholly referable to the stomach; flatulency after meals, early satiety, sudden nausea, feeling of cold with slight shudderings, acidity and water-brash.

Changes produced in the gall-bladder by infections through the bile, blood or lymphatics, are slight but recognizable by lack of lustre and color, thickening of texture of walls, loss of suppleness, and deposit of fat beneath serous surface. The whole gall-bladder is œdematous; cystic duct is enlarged; and the pancreas may be hypertrophied. Adhesions binding the gall-bladder to any neighboring structure—except normal mesentery and duodenum and colon—are always evidences of infection. Probably every adherent gall-bladder is so pathologically changed within its walls as to warrant removal.

GASTRIC AND DUODENAL ULCERS

While until recently most surgeons have advised simple gastro-enterostomy in the treatment of gastric ulcer, the unsatisfactory results in a certain percentage of cases have created a number of advocates for more radical procedures. Excision of the ulcer with or without gastro-enterostomy has in some instances been replaced by removal of the entire ulcer-bearing area of the stomach as a method of cure. Although resection of large portions of the stomach has been followed by a comparatively small percentage of mortality in the hands of those operators who have become proficient in the technic devised by them for this procedure, nevertheless, in the light of present experience, the general adoption of so radical a procedure does not seem justified in the great majority of cases. Inasmuch as the causative factors responsible for gastric ulcer are still a matter

of conjecture, the surgeon without preconceived ideas as to the technic to be followed will do well to decide for himself after an exposure of the site of the lesion as to the course and extent of operative procedure for the individual case.

Mayo (*J. A. M. A.*, 1922, lxxix, 19), in a discussion of the progress in the handling of chronic peptic ulcer, summarizes his views as follows: (1) Duodenal ulcer is treated satisfactorily by surgery in approximately 95 per cent. of cases, although in 1 or 2 per cent. of these a second operation may be required. The ulcer is not associated with cancer liability. (2) The average operative mortality in cases of duodenal ulcer, including the acute and chronic cases, is under 2 per cent. from all causes; and, as the part of the duodenum usually involved is merely the vestibule of the small intestine, permanent interference with function is but slight.

(3) In cases of gastric ulcer, satisfactory results are obtained by one operation in more than 85 per cent. In the remaining cases, a secondary operation, preferably resection, which eliminates, to a great extent, future ulcer possibilities, brings the surgically satisfactory group of gastric ulcers well above 90 per cent., but there is a definite cancer liability in the years to follow.

(4) The average mortality in the operative treatment of cases of gastric ulcer, including the acute and chronic cases, is about 3.5 per cent. The stomach has important functions to perform and a certain amount of permanent crippling may result.

(5) In about 50 per cent. of the patients who fail to obtain satisfactory relief, the difficulty is functional and may be relieved by medical management. The other 50 per cent. must be classified as surgical for relief.

(6) The patient's general condition must be considered and rational habits of living established. The elimination of all sources of focal infection is also an essential measure.

Conybeare (*Guy's Hosp. Rep.*, 1922, lxxii, 174) in a report on the late results of operation in cases of gastric and duodenal ulcers states that of the patients operated on for peptic ulcer and traced over periods from three to eleven years, about 60 per cent. are either completely cured or suffer only slight abdominal symptoms. About 40 per cent. either died of gastric disease, suffered from recurrence

of their symptoms, or were but little improved. As regards results of different operations, simple resection of the ulcer gave very unsatisfactory results. In only one-sixth of the cases was the result really good. With gastro-jejunostomy about 65 per cent. were cured or much improved, while 35 per cent. were unsatisfactory.

The highest percentage of good results was obtained after gastro-jejunostomy in cases where there was pyloric obstruction. When the latter was not present, gastro-jejunostomy was slightly more successful in cases of duodenal ulcer than in those of gastric ulcer. Other operations, such as ileo-sigmoidostomy and colectomy, were too rarely performed to allow an opinion as to results, except that these showed a rather high immediate mortality.

As regards test-meal results after gastro-jejunostomy, there does not appear to be any definite type of curve. All that can be said is that most of the duodenal ulcer cases have a high acid after operation, while most of the lesser curvative ulcers show either a low acid or complete absence of free hydrochloric acid. There is no obvious correlation of symptoms with either high or low acid curves. Recurrence takes place as frequently apparently in cases with no free acid as in those with a high acid.

X-ray examinations show that in nearly all cases very rapid emptying of the stomach takes place *via* the stoma, even ten years after operation. Practically all the food leaves through the stoma; in only a few instances does it pass through the pylorus. If the stoma is found not to be working there is always evidence suggestive of gastro-jejunal ulceration having taken place at some previous date.

The relative value of surgical and medical treatment of gastric and duodenal ulcer is discussed by Bevan (*J. A. M. A.*, 1922, lxxix, 22). He states that the ulcer may be excised by one of several methods and the patient cured by an operation which carries a certain amount of risk, which varies enormously with the skill and experience of the operating surgeon. Ninety per cent. of ulcers of the duodenum and 50 per cent., or more, of ulcers of the stomach may be cured by gastro-enterostomy, which again carries a certain amount of risk, probably less than 2 per cent. in skilled hands, with an associated risk of developing a jejunal ulcer in 3 per cent., or more, of the cases. As to the manner in which gastro-enterostomy cures an ulcer of the

stomach and duodenum, Bevan believes that the value of gastro-enterostomy is in the safety valve action of the new opening, the relief of tension.

Cure of peptic ulcer by jejunostomy is effected by placing the ulcer at rest by feeding the patient through the jejunal tube. In spite of the efficiency, the operation is not a very practical method of treatment and should be reserved as a preliminary procedure in seriously handicapped patients. In one case by a jejunostomy Bevan was able to save the life of a man who had at the time of operation but 17 per cent. hæmoglobin.

Excision of peptic ulcer may be accomplished either by an oval or wedge-shaped incision, or by transverse resection of the stomach or by what is now being tried rather extensively, a resection of the stomach and duodenum by the Billroth II and Billroth I operations. In the hands of a few expert surgeons, Moynihan, Haberer, Clairmont, Eiselberg, and Schmieden, these operations have proved surprisingly successful. They have reported series of 50 or more cases with from 1 to 2 per cent. mortality. Three things are definitely accomplished by the Billroth excision: (1) Removal of the ulcer; (2) removal of the pylorus and the element of pylorospasm; (3) lessening of free hydrochloric acid contents of the gastric juice and removal of a possibly existing or potential carcinoma.

DeQuervain (*Surg., Gyn. and Obst.*, 1922, xxxiv, 1) states that because of the danger of the peptic ulcer following operation and because of the repeated bleeding from the primary ulcer, his clinic has abandoned schematic gastro-enterostomy and leans more to resection. Results are summarized as follows:

(1) Ninety per cent. of ulcer recurrences, peptic ulcer and other disturbances, occur in the first four years after operation, so that statistics which depend on results reported earlier than four years after operation are apt to show too favorable results. Observations made in the first four years do not contain all possible sequelæ, and later observations must be made to secure final results.

(2) Simple gastro-enterostomy produces in all forms of gastric ulcer about the same early results—somewhat more than four-fifths cure or improvement approximating cure.

(3) Observations made over longer periods and including all cases show for gastro-enterostomy for all types of gastric ulcer, a cure

or improvement in 75 per cent. of cases. In ulcers at a distance from the pylorus the average results are no less favorable than in those at the pylorus.

(4) The radical methods, irrespective of interval, show results similar to those in gastro-enterostomy at early periods, with a cure in about 80 per cent.

The V-shaped excision has proved a bad method not only in DeQuervain's hands but in those of others. With sleeve resection, however, in gastric ulcer, there is a cure in 90 per cent. of the cases. This is a result not found in gastro-enterostomy, indeed, even if compared only with the more favorable statistics as derived from tabulations made early after operation.

Similarly with duodenal ulcer, gastro-enterostomy yields 65 per cent. cures with or without Von Eiselberg exclusion, while in nine cases operated upon by resection DeQuervain finds that all remain cured. If properly executed, resection yields better end results than gastro-enterostomy whether in a case of gastric or duodenal ulcer.

In a review of surgical treatment of peptic ulcer for 1921 at the Liverpool Northern Hospital, Monsarrat (*Brit. Med. J.*, 1922, i, 553) affirms that the surgical remedy for duodenal ulcer is posterior gastro-jejunostomy. The practice of adding either an excision of the ulcer or occlusion of the pylorus appears unnecessary as failure to obtain permanent relief by gastro-jejunostomy is very exceptional. Monsarrat has employed occlusion of the pylorus on many occasions; he now thinks that it has no effect on the result in duodenal ulcer, and doubts whether it is physiologically sound. In gastric ulcer, ulcer excision alone is not sound, and gastro-enterostomy, while a remedy of value even in inveterate gastric ulcer, is not the remedy of choice. The more radical operation, partial gastrectomy, includes two different procedures, either (a) sleeve resection with gastro-gastrostomy, or (b) resection of more or less of the stomach, including the ulcer, closure of the duodenum, and anastomosis of the stomach and jejunum.

Sleeve resection has only a limited field; it is the operation of choice for mid-gastric cicatrized ulcer. In the presence of active ulcer it is open to the same objection as simple ulcer excision in that it does nothing to modify the chemistry of the gastric secretion.

Partial gastrectomy with a gastro-jejunal anastomosis removes the ulcer and the ulcer-bearing area, and renders the stomach incontinent, and prevents the accumulation of a noxious gastric secretion. Monsarrat's cases were treated by the posterior Polya or Reichel operation; in none have there been signs of anastomosis constriction, probably, since it was possible to sew the margins of the mesocolic gap to the stomach wall in all cases.

Horsley and Vaughan (*J. A. M. A.*, 1922, lxxviii, 1371), writing on the value of pyloroplasty in reference to gastric and duodenal ulcer, consider that gastro-enterostomy is preferable to pyloroplasty (1) when there is extensive stenosis so that most of the normal tissue near the pylorus has been destroyed; (2) when there is a large ulcer in the first portion of the duodenum or in the pyloric end of the stomach, accompanied by extensive leucocytic infiltration, and especially if there is a subacute perforation; and (3) when adhesions are very extensive, especially with only slight diseases of the gall-bladder.

The type of cases in which pyloric or duodenal ulcer exists, and the pylorus is open and there are no adhesions, clearly calls for a pyloroplasty. Acute perforation of small ulcers is similarly treated. This restores the stomach as nearly as possible to its normal physiologic condition. Also, when there is but little injury to the structures of the stomach or duodenum, as in a narrow stenosis, pyloroplasty is indicated. When the diseased condition of the stomach or duodenum is well localized, and can be completely extirpated or corrected without serious harm to the anatomy or function of the tissues, it would be as unwise to perform a gastro-enterostomy as it would be to amputate for a comparatively slight lesion of the leg. In this type of case in which the pylorus is open, gastro-enterostomy gives the worst results.

Kehling (*Arch. klin. Chir.*, 1921, cxvii, 68) cites eight cases of peptic ulcer in which the pylorus has been resected and five others in which peptic ulcer had developed after a Billroth I or II operation. This is in contrast to Haberer's (*Ibid.*, 50) statement that the pylorus enhances the danger of peptic ulcer in the jejunum, whether the pylorus is open or shut off. This is probably due to spasm of the pylorus, and, by resecting it, this factor is eliminated. In 710 resection operations on the stomach in which this principle was followed

there has been no instance of peptic ulcer to date, regardless of whether merely the pylorus or a large portion of the stomach has been resected. On the other hand, peptic ulcer developed in 20 per cent. of 71 cases in which the pylorus was merely tied off. Gastro-enterostomy alone is much less liable to induce a peptic ulcer; it occurred in scarcely more than 1 per cent. of Haberer's 265 cases of this kind.

Brutt (*Deutsche Med. Woch.*, 1921, xlvii, 1391) develops a point that he has found of advantage in reaching a differential diagnosis. Of 131 cases of perforating ulcer, 80 per cent. were in men and only 20 per cent. in women. He explains this striking fact by stating that pyloric and duodenal ulcers develop perforations much more frequently than those distant from the pylorus. Pyloric and duodenal ulcers are found almost exclusively in men. Of 99 perforating ulcers of the pylorus or duodenum, 95 per cent. were in men. On the other hand, of 32 perforations located at some distance from the pylorus only 30 per cent. were in men. From another angle, 82 per cent. of the perforated ulcers in women are distant from the pylorus. This finding has a certain differential diagnostic value with respect to cholelithiasis. In women, a severe spontaneous pain in the right side of the abdomen, other things being equal, points more to biliary colic than to perforating ulcer. Schmieden (*Zentralbl. f. Chir.*, 1921, xlviii, 1534) is convinced that in the past too much of the healthy stomach wall has been sacrificed in segmental resection for gastric ulcer. He describes, with illustrations, three methods of what he terms a staircase operation for gastric ulcers of the lesser curvature, and for saddle ulcers near the pylorus. These operations save a much larger portion of the stomach wall than do the usual methods.

Lorenz and Schur (*Archiv. f. klin. Chir.*, 1922, cxix, 239) present evidence that the antrum controls secretion in the stomach. In a recent reëxamination of 70 of the 208 patients treated by resection of the antrum for gastric ulcer, they found that none of the 43 whose antrum had been entirely removed had any return of ulcer symptoms, while seven of the twelve who had part of the antrum left still have more or less ulcer symptoms. However, Mandl, Frisch and Denk have published instances of peptic ulcer developing after antrectomy. There is evidently a special predisposition to ulcer in such cases, and

for this as well as for other reasons, resection of the antrum should be preferred to gastro-enterostomy in all cases. Finsterer (*Arch. f. klin. Chir.*, 1922, cxx, 111) declares that the best way to ward off post-operative peptic ulcers is to resect as much as possible of the secreting surface of the stomach, with removal of 75 to 80 per cent. of the stomach.

Operation for post-operative jejunal ulcer, Alapy, of Budapest, (*Zentralbl. f. Chir.*, Feb. 25, 1922, xlix, 253) recommends in cases of post-operative peptic jejunal ulcers that arise after gastro-enterostomy on account of a constricting duodenal ulcer, that normal anatomic conditions be restored by excision of the jejunal ulcer, resection of the anastomosis loop, with end-to-end suture, plus pyloroplasty.

GASTRO-ENTEROSTOMY

In a survey of the functional results of gastro-enterostomy at Mt. Sinai Hospital, Wilensky (*Am. J. Med. Sci.*, 1922, clxiv, 209) presents evidence which tends to show that a gastro-enterostomy made with the aid of a Murphy button is superior to one made by the suture method.

It seems to the present reviewer that a small stoma as created by the Murphy button is not adequate in many of the cases showing indication for establishing a new communication between the stomach and intestine, as it has been clearly demonstrated that the stomata, particularly those created with the aid of the button, had a tendency to contract in due course of time. In those cases where pyloric obstruction is one of the indications for operation, a small stoma, as created by the Murphy button, would not be sufficient in certain instances to ward off the danger of impending gastric tetany. It seems that while the comparative simplicity of the application of the button make it advantageous in those cases where a resection of a considerable portion of the stomach has been performed, it is not suitable for those cases in which an already dilated stomach requires emptying through a newly created opening. Clinically, at least, it may be said that the perfection of gastro-enterostomy by suture resulted from the inefficiency of the Murphy button so extensively used formerly for this operation.

Spriggs and Marxer (*Lancet*, 1922, i, 725), in a report of 65 cases seeking relief after short-circuiting operations, state that about half the patients asking relief after gastro-enterostomy recovered from their symptoms or improved greatly with lapse of time and medical treatment.

In most of the others, a detailed investigation showed abnormalities capable of relief by further operation; these were especially the regular presence of bile in the stomach; the fact of the stoma not being in the lowest part thus causing accumulation of food between the stoma and the pylorus; an abnormal appearance of the jejunal loops; dilatation of the duodenum with regurgitation of bile; evidence of ulceration in the neighborhood of the stoma or of active ulceration of the stomach or duodenum. Except for structural disease short-circuiting operations upon the colon should not be performed, unless (1) suitable and persistent medical treatment has failed; and (2) sound scientific reasons can be put forward for believing that the operation will benefit the patient.

Razzaboni (*Archivio Ital. Chir.*, 1921, iv, 553) emphasizes the gravity of the disturbances resulting from the vicious circle after gastro-enterostomy. Although improved technic has rendered it much rarer than formerly, it still occasionally happens, even when there is no discoverable cause; once installed, and rebellious to change of position and the stomach tube, the only relief is from a new operation, and for this a supplementary anastomosis, with or without gastrotomy, or a new gastro-enterostomy or a plastic operation on the stomach according to Kraske should be considered. Early intervention is the only means of warding off irreparable damage. Razzaboni's critical, clinical and experimental study of the acute vicious circle fills nearly 100 pages. The numerous plates of the experimental findings confirm the autodigestion of the mucosa, and injury of the liver, pancreas, etc.

Thalheimer (*J. A. M. A.*, Jan. 21, 1922, lxxviii, 190) describes a simple, inexpensive apparatus for the slow intravenous injection of glucose solution, which satisfactorily answers the purpose of Woodyatt's more expensive outfit. The device consists of an ordinary intravenous infusion set, with the flow regulated by a glass stopcock and a 10 c.c. buret graduated to 0.1 c.c., introduced as a reservoir,

in order to determine accurately the rate of flow by observing the time required for delivery from the buret of a given amount of fluid. Thalheimer gives a full description of the details of his method. He has given glucose solution intravenously with the apparatus as slowly as 40 c.c. an hour for five hours. The rate could be made even slower, and also faster, if desired. The apparatus can be used for administering serums intravenously, such as antimeningococcus serum and arsphenamin.

CHRONIC MAXILLARY SINUSITIS OF ORAL ORIGIN

In a personal communication Dr. H. S. Dunning (M.D., D.D.S.) states that many apparently healthy people have in their maxillæ non-vital infected teeth draining continually into the spongy alveolar process and from hence into the maxillary sinus above. Being a chronic condition, this is not discovered unless the condition becomes acute, or unless the inquisitive practitioner finds it in taking a complete radiographic series of films of the teeth. There are absolutely no symptoms present; the teeth appear innocent; the antrum is not cloudy as there is sufficient drainage through the middle meatus in the lateral wall of the nose to prevent much accumulation of pus. Most surgeons would immediately extract these innocent-looking teeth if they communicate with the maxillary sinus. As X-ray plates taken at different angles disclose unquestionably different facts, and as teeth that do not really communicate with the antrum can be made to appear to do so in an X-ray film taken in a certain position, a positive diagnosis, namely, that the infected end of a bicuspid or a molar does communicate with the antrum should be made before the tooth is extracted. The only way to make a positive diagnosis as to condition of the root and its proximity to the antrum is to cut down on the suspicious tooth and to ascertain conditions by actually seeing the anatomical structures. This can be easily done under novocain $\frac{1}{2}$ per cent. A good-size flap over the end of the tooth is made and the end of the tooth is exposed with a sharp, thin chisel. If the bone is soft, it is curetted gently even though it leads one into the sinus. If in exposing the end of the tooth the antrum is opened, it is immediately washed out with warm saline solution. If the washings are cloudy, the opening is enlarged and a careful inspection of the antral cavity should follow. If the antrum is found to contain

polypoid material a radical antrum operation should be performed at once under local anæsthesia.

Good drainage should be established through the nose, and the mouth opening should be closed with fine dermal silk or horse-hair. If the tooth roots are found to be diseased, discolored, often nearly black, and if they are found to communicate with the antrum, the tooth should be removed at once. The tooth socket is curetted into the antrum if necessary in order to remove all dental pathology. The alveolar opening should be made as small as possible and packed very gently and allowed to heal rapidly to avoid reinfection of the antrum. The opening through the alveolus is made small because such openings are at times difficult to close; a flap operation is often necessary. Following the above procedure, both mouth wounds close in a few days, the alveolar wound by granulations, and the flap wound (which extends nearly to the canine fossa) by primary union. Post-operative treatment consists in a number of irrigations of the maxillary sinus through the nasal opening.

STEINACH OPERATION

Wolbarst (*N. Y. M. J.*, 1922, cxv, 543), in a report based on operations on eleven patients, seven actually senile, and five prematurely senile, remarks that if any conclusion is to be reached as the result of the study of these cases, one would be justified in saying that the operation had been distinctly advantageous to the patients who have been subjected to it. In the actually senile, the most striking result has been the marked decrease in blood-pressure, and a feeling of well-being that is appreciably noticeable. In these cases the sexual function seems to have become extinct and has not been influenced by the operation. In the prematurely senile cases, there is reason to believe that sexual function has been stimulated materially by operation. In view of the fact that it is painless, that it involves no risk, and that there is but little loss of time, there seems to be no reason why this operation should not be advocated in every case suggestive of endocrine insufficiency. In young men, the unilateral operation is advised as sufficient for the purpose; in cases where procreation is no longer desired, the double operation is to be recommended.

Marinesco (*Bull. Acad. Med.*, 1922, lxxxvii, 266) remarks that if Steinach had comprehended better the non-reversibility of biologic phenomena he would not have called his procedure "rejuvenation." Marinesco has applied it in three men of 56, 59, and 60, with Parkinsonian or tabetic symptoms, and a transient sexual erethism followed. In two months the senile condition was the same as before operation. "Growth and differentiation are the essential conditions of life. When an organism has reached the highest point of differentiation of which it is capable, it may remain stationary for a time, but decadence is then inevitable. There is never any going back; senility is an inexorable necessity of all living cells."

DeVrieze (*Nederland. Tijdschr.*, 1922, i, 266) reports what he thinks is the first necropsy after ligation of the vasa deferentia since Steinach's publications. In this patient, a man of 63 with hypertrophied prostate and undiagnosed hydronephrosis, and urosepsis, fatal three weeks after operation, the vasectomy was done as a preliminary to prostatectomy, but no influence on the prostate had been noticed. There seemed to be no consequences, neither good nor bad, from the vasectomy, thus confirming the harmlessness of the measure. The endocrine organs seemed intact; there was no increase in the interstitial cells, but the vas epididymidis had enlarged after vasectomy. As there had probably been no spermatogenesis in this case for some time, this enlargement suggests that the testicle still has some secretion to pass along, even when there are no spermatozoa.

Sand (*Ngeskr. Saeger.*, 1922, lxxxiv, 597) reports favorable experiences from operative treatment in fifteen cases of premature senility or impotency or depression. He thinks Steinach's principle is applied best by epididymectomy, resecting a segment, the farthest from the head of the epididymis, ligating and thermocauterizing the stumps, all under local anæsthesia, but with extreme care not to injure the delicate nerves and vessels necessary for the testicle.

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